https://doi.org/10.29309/TPMJ/2025.32.07.9807

The Professional Medical Journal
www.theprofesional.com
2025, Volume, 32 Issue, 07

ORIGINAL ARTICLE

Comparison between Bupivacaine alone and bupivacaine plus buprenorphine using ultrasound guided supraclavicular block at a tertiary care hospital.

Munazza Imdad[1], Hafiz Muhammad Saad Zafar[2], Mohsin Riaz Askri[3], Kausar Abbas Shah[4], Shumyala Maqbool[5], Nadeem Ahmad Khan[6]

Article Citation: Imdad M, Zafar MS, Askri MR, Shah KA, Maqbool S, Khan NA. Comparison between Bupivacaine alone and bupivacaine plus buprenorphine using ultrasound guided supraclavicular block at a tertiary care hospital. Professional Med J 2025; 32(07):803-808. https://doi.org/10.29309/TPMJ/2025.32.07.9807

ABSTRACT… Objective: To compare ultrasound-guided supraclavicular block with bupivacaine versus those receiving bupivacaine combined with buprenorphine. **Study Design:** Randomized Control Trials. **Setting:** Department of Anesthesia, Nishtar Hospital Multan. **Period:** 14th April 2023 to 13th October 2023. **Methods:** In total, 60 patients between the ages of 18 and 60 under brachial plexus block, appointments for elective elbow, forearm, and hand procedures were included. Local site infections, drug allergies, and coagulopathy (INR>1.5) were excluded. A brachial plexus block was performed on Group B using 35 ml, which included 30 ml of 0.5% bupivacaine and 5 ml of saline. Group A was given a brachial plexus block with 3µg/kg buprenorphine and 0.5% bupivacaine. The study assessed hemodynamic changes, the initiation of sensory and motor blockade, and the duration of the block in patients. **Results:** In this work, the average duration of sensory and motor block in bupivacaine alone vs bupivacaine plus buprenorphine were 285.67 ± 15.28 min vs 1149.43 ± 59.69 min and 225.27 ± 9.10 min vs 866.53 ± 26.17 min with p-value < 0.0001 respectively. **Conclusion:** In patients undergoing upper limb surgery, the comparison of sensory and motor blockade duration demonstrated that bupivacaine plus buprenorphine is superior than bupivacaine alone in supraclavicular block.

Key words: Bupivacaine, Buprenorphine, Supraclavicular Block.

INTRODUCTION

Both regional blocks and general anesthesia can be used for upper limb procedures. Axillary, supraclavicular, infraclavicular, and interscalene blocks. The musculocutaneous and ulnar nerves could be blocked through supraclavicular approach of the brachial plexus, which has a high success rate. The axillary and interscalene approaches may miss these nerves, respectively.[1] In addition to providing intraoperative anesthetic, peripheral nerve blocks guarantee postoperative analgesia free from systemic adverse effects. Anesthesiologists now prefer brachial plexus block for upper limb surgeries due to its improved effectiveness, reduced hospital stay, safety profile, cost efficiency, elimination of general anesthesia adverse effects, and adequate postoperative pain relief.[2-4] The supraclavicular brachial plexus block and its related sympathetic block are great ways to achieve optimal operating conditions for upper limb treatments because they completely relax the muscles while preserving hemodynamic stability.

Additionally, they offer prolonged surgical pain relief with little adverse effects. Better mental function preservation in the elderly is another benefit; intact pharyngeal and laryngeal reflexes reduce the risk of aspiration; difficult intubation is avoided; intubation-related postoperative complications are reduced; and improved postoperative analgesia without excessive sedation facilitates early mobilization and discharge.[5] To improve analgesia and lower the overall dosage of local anesthetic, a number of adjuvants have been used. Administering opioids peripherally enhances regional anesthetic without causing adverse effects that are mediated centrally. Because it acts for six to nine hours, bupivacaine is commonly used for

1. MBBS, Postgraduate Resident Anesthesia, Nishtar Hospital, Multan.
2. MBBS, FCPS, Consultant Anesthesia & ICU, Multan Institute of Kidney Disease, Multan.
3. MBBS, FCPS, Assistant Professor Anesthesia, Children Hospital & The Institute of Child Health Faisalabad.
4. MBBS, FCPS, Consultant Anesthesia, City Hospital, Multan.
5. MBBS, FCPS, Senior Registrar Anesthesia, Allied Hospital, Faisalabad.
6. MBBS, FCPS, Professor Anesthesia, Nishtar Hospital, Multan.

Correspondence Address:
Dr. Mohsin Riaz Askri
Department of Anesthesia
Children Hospital & The Institute of Child Health Faisalabad.
mohsinriazaskri@gmail.com

Article received on: 22/04/2025
Accepted for publication: 24/06/2025

supraclavicular nerve blocks.[6] This may not be enough to offer post-operative analgesia, but it will provide intraoperative anesthesia. The patient requests rescue analgesia due to postoperative pain, which is often supplied by opioids and nonsteroidal anti-inflammatory medications. The necessity for rescue analgesia and the negative effects of intravenous (IV) analgesics can be avoided by extending the effects of bupivacaine.[1]

In a rigorous experimental study conducted across healthcare facilities in India, a total of 60 participants spanning both genders and aged between 18 and 50 years were randomly allocated into two equivalent groups of 30 individuals each. The total sensory blockade period measured approximately 898 minutes, demonstrating a narrow variation of ±32.33 minutes when the anesthetic combination included bupivacaine and dexmedetomidine, and 645±70.11 minutes with inj bupivacaine alone. 50 patients of either gender, ages 20 to 70, with ASA grades I and II were selected for another randomized control study in India. They were split into two groups of 25 each. Additionally, compared to the Bupivacaine Group (4.94 ± 0.70 h), the Bupivacaine plus Buprenorphine group experienced a considerably longer mean duration of sensory block (5.71 ± 0.94 h).

There are numerous studies taken throughout the world regarding addition of adjuvants to inj. bupivacaine but local data is lacking. So, our study will help in providing data for effective treatment modality to patients in terms of Buprenorphine as an adjuvant compared with Bupivacaine alone that enhances neural blockade quality while maintaining economic feasibility.

The objective of the study was using ultrasound-guided supraclavicular block at a tertiary care hospital, compare the average duration of sensory and motor block between bupivacaine alone and bupivacaine with buprenorphine."

Operational Definitions

Sensory block duration is calculated as the time interval (in minutes) spanning from the first manifestation of neural sensory interruption to the complete restoration of normal sensory function (sensory Grade 0), verified through standardized clinical evaluation.

The time interval spanning from the starting of the motor block and to the complete restoration of hand and wrist mobility is known as the motor block duration. Stated otherwise, Motor Grade 0 was attained.

Three Point Scale

1. Grade 0: no block
2. Grade 1: persistent touch and sensory block
3. Full sensory block in grade two.

Motor Block Grading

- 0: The upper limb does not move against gravity at all.
- 1: Hand flexion and/or extension without arm flexion or extension.
- 2: Movement of the hands and arms in flexion and/or extension against gravity, not against resistance
- 3: Hands and arms moving in flexion and extension against resistance.

METHODS

This Randomized control trial was conducted at Department of Anesthesia, Nishtar Hospital Multan from 14th April 2023 to 13th October 2023 after ethical approval from institutional review board (Ref No. 21476/NMU Dated: 09-12-2024).

Non-probability and Consecutive sampling was used.

Using open Epi software, the sample size was determined using: Group A experienced a sensory block for an average of 5.71 ± 0.94 hours, while Group B experienced a sensory block for an average of 4.94 ± 0.70 hours. 1 α = 5% and test power = 80% at a confidence level of 95%. While preliminary calculations indicated a potential sample size of six, we significantly augmented the research population to 60 individuals, strategically divided into two balanced groups of 30 participants.

a. Inclusion Criteria

- Participants within the 18-60 year age range who are ASA physical status grades I and II, With brachial plexus block, elective elbow, forearm, and hand surgery is planned.

b. Exclusion Criteria

- Allergy to drug
- Local site infection
- Coagulopathy (INR>1.5)
- Patients not giving consent.

The physical state of 60 ASA I & II, following the institutional ethical committee's approval and the patients' signed informed consent, Individuals designated for planned surgical interventions involving hand and forearm orthopedic procedures were enrolled. Using the lottery method, patient groups were formed. Age, gender, weight, and residence location were among the baseline data recorded using a proforma. Prior to surgical intervention, key vital signs were systematically assessed, encompassing baseline heart rate, oxygen saturation level, and blood pressure. No sedatives or anxiety-reducing drugs were taken beforehand. For each patient, a consultant anesthesiologist guided the supraclavicular approach for brachial plexus block using a linear probe. A brachial plexus block was performed on Group B using 35 ml, which included 30 ml of 0.5% bupivacaine and 5 ml of saline. Group A was given a brachial plexus block with 3µg/kg buprenorphine and 0.5% bupivacaine. Patients were assessed for changes in hemodynamics, the onset of motor and sensory block, and the block time duration. Every three minutes following a drug injection, sensory block was evaluated using a three-point rating system and the pin prick method. Motor block grading was used to note and evaluate the motor block's onset. The length of the motor and sensory block was recorded. An anesthetist with at least three years of expertise evaluated sensory and motor blocks with the time interval of five minutes for initial half hour (30 m), followed by hourly assessments continuing through the eight-hour mark. Proforma was used to record all of the data.

Data Analysis Procedure

SPSS version 26 was used for entering and analyzing each item of data. For quantitative data, the sensory and motor block average duration, standard deviation, age, and weight were computed. The frequency and proportion of qualitative attributes, such as gender and place of residence, were displayed. The independent t test was used to compare the mean durations of the sensory and motor blocks in the two groups. Age, weight, and gender were among the effect modifiers that were managed through stratification. Following the completion of stratification, the independent sample t test was utilized. The threshold for a meaningful value P was <0.05.

RESULTS

The study's participants ranged in age from 18 to 60, with a mean age of 41.45 ± 11.06 years. Patients in groups A and B had mean ages of 42.40 ± 11.05 and 40.50 ± 11.18 years, respectively. According to Table-I, the majority of the patients—34, or 56.67 percent—were between the ages of 41 and 60.

The male to female ratio of these 60 patients was 1.4:1, with 35 (58.33%) being male and 25 (41.67%) being female (Figure-1). The average weight was 72.91 ± 6.72 kg.

According to my research, the sensory and motor block averaged duration in the groups treated with bupivacaine alone versus bupivacaine + buprenorphine was 285.67 ± 15.28 minutes versus 1149.43 ± 59.69 minutes and 225.27 ± 9.10 minutes versus 866.53 ± 26.17 minutes, respectively, with a p-value < 0.0001 (Table-II).

Age (Years)	Group A (n=30)		Group B (n=30)		Total (n=60)	
	No.	%	No.	%	No.	%
18-40	12	40.0	14	46.67	26	43.33
41-60	18	60.0	16	53.33	34	56.67
Mean ± SD	42.40 ± 11.05		40.50 ± 11.18		41.45 ± 11.06	

Table-I. Distribution of ages in both groups (n=60).

	Group A (n=30)	Group B (n=30)	P-Value
Sensory block duration (min)	1149.43 ± 59.69	185.67 ± 15.28	0.0001
Motor block duration (min)	866.53 ± 26.17	225.27 ± 9.10	0.0001

Table-II. Comparing the average length of sensory and motor block with ultrasound-guided supraclavicular block for bupivacaine alone vs bupivacaine + buprenorphine (n=60).

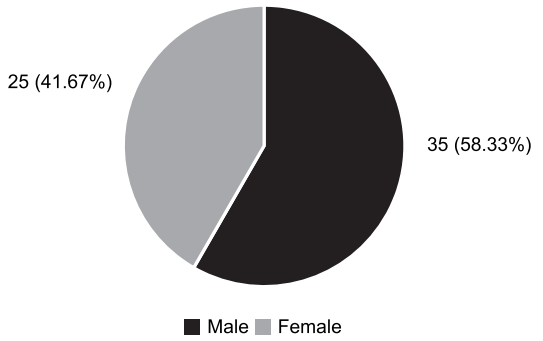

Figure-1. Patient distribution based on gender (n=60)

DISCUSSION

While local anesthetics alone provide ideal intraoperative conditions for supraclavicular brachial plexus block, postoperative analgesia duration is decreased. Dexamethasone, α2-adrenergic agonists, buprenorphine, butorphanol, and tramadol are examples of adjuvants that are used to speed up the block's onset and extend the duration of postoperative analgesia.[7] In conjunction with bupivacaine, opioids work in tandem with local anesthetics to enhance the quality of block and extend the duration of analgesia.[8] The artificial opioid-like substance butorphanol has agonistic activity at kappa receptors and partly antagonistic activity at μ receptors.[9] Several investigations have employed doses starting at 20 μg/kg.[10]

Some papers claim that small side effects have been associated with dosages as high as 2 mg. The average duration of sensory and motor block for bupivacaine alone versus bupivacaine + buprenorphine was assessed in this study using ultrasound-guided supraclavicular block. The bupivacaine + buprenorphine group experienced sensory and motor block for an average of 866.53 ± 26.17 minutes, whereas the bupivacaine alone group experienced it for an average of 285.67 ± 15.28 minutes, compared to 1149.43 ± 59.69 minutes. The p-value for this study was less than 0.0001. Two groups of 30 patients each were formed from 60 patients of either gender, aged 18 to 50, in a randomized controlled study conducted in India. When bupivacaine and dexmedetomidine were administered together, the average duration of sensory block was 898±32.33 minutes, while when bupivacaine was administered alone, it was 645± 70.[11] minutes. 50 patients of either gender, ages 20 to 70, with ASA grades I and II were selected for another randomized control study in India. They were split into two groups of 25 each. Additionally, compared to the Bupivacaine Group (4.94 ± 0.70 h), the Bupivacaine plus Buprenorphine group experienced a considerably longer mean duration of sensory block (5.71 ± 0.94 h). 60 patients of either sex, ages 20 to 60, participated in a different randomized controlled study.[13]

Under axillary brachial plexus block, ASA grade I or II patients are having elective hand, forearm, and elbow surgery. Two groups of patients were randomly selected. In axillary block, group-I was given 30 milliliters of 0.35% bupivacaine alone. In axillary block, Group-II was given 30 milliliters of 0.35% Bupivacaine and 3 μg/kg Buprenorphine. Both groups' total block duration and the time it took for the motor and sensory block to start and finish were recorded. Any complications that arose during the operation, during surgery, or after the procedure were recorded and addressed. In peripheral nerve block, the addition of buprenorphine (3μg/kg) to the bupivacaine combination had no effect on the onset period for either motor or sensory block. Group I's motor block time was 284.33±78.94 minutes, while Group II's was 307.33±60.26 minutes. While the average sensory block duration in group II was 580.166±111.45 minutes, it was 305.066±83.64 minutes in group I. It suggests that group II's sensory blackout lasted longer than group 12's.

Forty patients undergoing upper limb surgery under supraclavicular subclavian perivascular brachial plexus block (SSPB) were randomized participant distribution, characterized by prospective methodology, and comprehensive blinding methodology.[14] Twenty participants acquired 30 milliliters of 0.3% bupivacaine in control Group-I, saline 1 milliliter, 1 milliliter of medicine, and 3 μgkg-1 buprenorphine + saline intramuscularly to produce a volume of 1 milliliter. One milliliter of the research drug (3μgk.kg-1 bupivacaine + saline to generate volume=1 ml), thirty milliliters of 0.3% bupivacaine, and one milliliter of saline intramuscular injection were administered to twenty patients in Group-II (the study group). The motor block and sensory block in Group I began at 4.05+0.944 and 6.65+1.182 minutes, respectively. The onset time durations for motor block and sensory block in Group-II were 3.75+1.208 and 4.25+1.25 minutes, respectively. For sensory and motor block, the found variations have no substantial difference ($p<0.404$ and $p<0.152$, respectively). Group I experienced adequate analgesia for an average of 331.2+33.54 minutes, while Group II experienced it for 680.6+86.27 minutes. The observed length variations achieved extreme statistical significance ($p<0.0001$). Group I and Group II had mean motor block durations of 309+26.1 and 329+28.4 minutes, respectively, which were not statistically significant ($p<0.352$). No patient in our study had respiratory depression or shivering. These side effects have either been completely absent or extremely rare in other studies using epidural butorphanol for postpartum analgesia.[14]

Butorphanol has actually been recommended to prevent the negative effects of pure opioid agonists (morphine) and has demonstrated notable efficacy to treat intractable itching associated with dermatological conditions.[15] As a partial opioid receptor agonist, buprenorphine is a potent analgesic. It is believed that peripheral nerve terminals have opioid receptors, and that buprenorphine's high lipophilicity increases the likelihood that it will bind to these receptors. By stimulating these peripheral selective opioid receptors, buprenorphine functions as an adjuvant in peripheral nerve blocks, resulting in analgesia and significantly prolonging the duration of action of local anesthetics.[17,18]

CONCLUSION

This study concluded that the bupivacaine plus buprenorphine is more effective than the bupivacaine alone in supraclavicular block in patients undergoing upper limb surgery concerning of mean duration of sensory and motor blockade. So, we recommend that bupivacaine plus buprenorphine should be used preferably in patients undergoing supraclavicular block in order to reduce the patient's morbidity.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

REFERENCES

1. Kumar R, Jaiswal A. **Nalbuphine as an adjuvant to bupivacaine in ultrasound-guided brachial plexus blockade: A meta-analysis of randomized and controlled trials.** Asian J Med Sci. 2024 Jan 1; 15(1):254-61.

2. Shaik R, Latha S, Rama Rao M, Paleti S. **Efficacy of 0.5% levobupivacaine with clonidine 30 µg versus 0.5% levobupivacaine with 150 µg buprenorphine for USG guided interscalene brachial plexus block for shoulder, upper and middle humerus surgeries: A prospective randomized double blinded comparative study.** Int J Res Med Sci. 2024 Apr 30; 12(5):1542-8.

3. Sreelakshmi V, Niyaz PV, Nagaraju T, Aluri A. **To compare the effects of adding buprenorphine vs dexmedetomidine in patients undergoing forearm surgeries under supraclavicular brachial plexus block.** Int J Health Sci. 2022; (I):8488-98.

4. Sharma A, Kumari A, Gupta R, Kaur S, Arora D, Kaur K. **Comparison of intrathecal bupivacaine-fentanyl and bupivacaine-butorphanol combinations for joint replacement surgeries.** J Anaesthesiol Clin Pharmacol. 2022 Jan 1; 38(1):79-83.

5. Mohamed HS, Gad GS. **Bupivacaine-dexmedetomidine versus bupivacaine-nalbuphine in ultrasound-guided supraclavicular brachial plexus block: A prospective, randomized, double-blind study.** Ain-Shams J Anesthesiol. 2021 Jan 14; 13(1):8488-98.

6. Sivakumar S, Rajarajeswaran K. **Use of dexemedetomodine or buprenorphine along with bupivacaine for ultrasound guided brachial plexus block: A comparative randomized prospective study.** Indian J Clin Anaesth. 2016; 3(4):604-6.

7. Ghasemi A, Chamanara M, Paknejad B, Yousefizoshk M, Hazrati E. **Dexmedetomidine versus sufentanil as adjuvants to bupivacaine for brachial plexus block during upper extremity surgery: A randomized clinical trial.** Brazilian Journal of Anesthesiology. 2023 Nov 20; 73(6):736-43.

8. Shakya S, Singh J, Ghimire A, Shrestha B. **Supraclavicular brachial plexus block: Comparison of varying doses of dexmedetomidine with ropivacaine.** Kathmandu Univ Med J. 2021 Sep 30; 19(3):345-50.

9. Hasan S, Chowdhury AA, Khatoon SN, Barua K, Alam AS. **Efficacy and safety of dexamethasone versus fentanyl as an adjuvant with bupivacaine and lignocaine in supraclavicular brachial plexus block.** J Bangladesh Soc Anaesthesiol. 2019 Feb 1; 32(1):10-7.

10. Bharathi B, Praveena BL, Krishnaveni KN. **Supraclavicular brachial plexus block: Comparison of varying doses of butorphanol combined with levobupivacaine–A double-blind prospective randomized trial.** Anesth Essays Res. 2019 Jan 1; 13(1):174-8.

11. Chiruvella S, Konkyana SK, Nallam SR, Sateesh G. **Supraclavicular brachial plexus block: Comparison of varying doses of nalbuphine combined with levobupivacaine: A prospective, double-blind, randomized trial. A prospective, double-blind, randomized trial.** Anesth Essays Res. 2018 Jan 1; 12(1):135-5.

12. Narang D, Kumar G. **Comparative study between bupivacaine alone and bupivacaine with fentanyl in axillary plexus block for upper limb surgeries.** J Evid Based Med Healthc. 2018 Jun 14; 5(25):1886-92.

13. Hamed MA, Ghaber S, Reda A. **Dexmedetomidine and fentanyl as an adjunct to bupivacaine 0.5% in supraclavicular nerve block: A randomized controlled study.** Anesth Essays Res. 2018 Apr 1; 12(2):475-9.

14. Sane S, Shokouhi S, Golabi P, Rezaeian M, Kazemi Haki B. **The effect of dexmedetomidine in combination with bupivacaine on sensory and motor block time and pain score in supraclavicular block.** Pain Res Manag. 2021; 2021(1):8858312.

15. Basunia SR, Mukherjee P, Munshi MB. **Comparison of intrathecal fentanyl and butorphanol as an adjuvant to intrathecal bupivacaine 0.5% in infraumbilical surgeries-a randomised double-blind study.** J Clin Diagnostic Res. 2020 Aug 1; 14(8):9.

AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Munazza Imdad:** Design the research, write paper, interpretation of discussion.
2	**Hafiz Muhammad Saad Zafar:** Collected data, literature search.
3	**Mohsin Riaz Askri:** Data collection, assist in writing, analyzed the data.
4	**Kausar Abbas Shah:** Revised original manuscript, interpretation in results writing.
5	**Shumyala Maqbool:** References, design the results.
6	**Nadeem Ahmad Khan:** Data entry in SPSS, Other technical help.