International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

Comparison of Varying Doses of Nalbuphine (5 mg vs 10 mg) with 0.5% Levobupivacaine in Ultrasound-Guided Supraclavicular Brachial Plexus Block

Shilpi Tada [1], Arun Kumar[2], K K Kshayap[3]

[1]Specialist Medical Officer (SMO), Department of Anaesthesia, Sadar Hospital, Araria, Bihar (India).
[2]Assistant Professor, Department of Pharmacology, Viraat Ramayan Institute of Medical Sciences (VRIMS), Chakiya, Bihar (India).
[3]Superintendent, Sadar Hospital, Araria, Bihar (India).

OPEN ACCESS

Corresponding Author:

Arun Kumar
Assistant Professor,
Department of Pharmacology,
Viraat Ramayan Institute of Medical Sciences (VRIMS),
Chakiya, Bihar (India).
Email ID:
ARUNAKASH71@gmail.com

Received: 30-05-2026
Accepted: 22-06-2026
Available online: 02-07-2026

ABSTRACT

Background: Nalbuphine, a κ-opioid receptor agonist and μ-antagonist, has shown promise as an adjuvant to local anaesthetics in peripheral nerve blocks, but the optimal dose remains unclear. This study compared the effects of 5 mg versus 10 mg nalbuphine added to 0.5% levobupivacaine in ultrasound-guided supraclavicular brachial plexus block for upper limb surgeries.
Methods: A prospective, double-blind, randomised controlled trial was conducted on 60 adult patients (ASA I/II) undergoing elective upper limb surgery. Patients were randomised into two equal groups: Group NB1 (n=30) received 5 mg nalbuphine + 20 ml 0.5% levobupivacaine, and Group NB2 (n=30) received 10 mg nalbuphine + 20 ml 0.5% levobupivacaine. All blocks were performed under ultrasound guidance.
Results: Group NB2 showed significantly faster onset of sensory (8.59 ± 2.12 vs. 10.57 ± 3.90 min, p=0.0176) and motor (14.57 ± 2.26 vs. 17.87 ± 2.60 min, p<0.0001) blockade. Duration of sensory block (611.31 ± 75.90 vs. 516.86 ± 75.96 min), motor block (574.77 ± 63.41 vs. 484.91 ± 65.48 min), and postoperative analgesia (827.07 ± 99.46 vs. 695.81 ± 104.21 min) were significantly prolonged in Group NB2. VAS scores were significantly lower in Group NB2 from 4 hours onward. Hemodynamic parameters remained stable, and adverse effects were infrequent and comparable between groups, with no respiratory depression reported.
Conclusion: The 10 mg dose of nalbuphine provides superior block characteristics and prolonged postoperative analgesia compared to 5 mg when added to 0.5% levobupivacaine in ultrasound-guided supraclavicular brachial plexus block, without increasing adverse effects. The 10 mg dose is recommended as the optimal dose for clinical practice.

Keywords: *Nalbuphine, Levobupivacaine, Supraclavicular brachial plexus block, Ultrasound-guided, Adjuvant, Postoperative analgesia.*

INTRODUCTION

Regional anesthesia techniques, particularly brachial plexus blocks, have become a cornerstone in the perioperative management of upper extremity surgeries, offering targeted analgesia, reduced opioid consumption, and improved patient outcomes compared to general anaesthesia alone [1, 2]. Among these, the supraclavicular approach to the brachial plexus block provides reliable anesthesia for procedures involving the upper limb distal to the shoulder by targeting the plexus where the trunks and divisions are compactly arranged, facilitating rapid onset and dense blockade. The advent of ultrasound guidance has significantly enhanced the safety and efficacy of this technique by enabling real-time visualisation of neural structures, the subclavian artery, pleura, and needle trajectory, thereby minimising complications such as pneumothorax, vascular puncture, and nerve injury while improving block success rates and onset times [3, 4].

Levobupivacaine, the S(-)-enantiomer of bupivacaine, is a long-acting amide local anaesthetic widely employed in peripheral nerve blocks due to its favourable safety profile relative to racemic bupivacaine [5]. It exhibits lower cardiotoxicity and central nervous system toxicity owing to reduced affinity for cardiac sodium channels and faster dissociation kinetics, while maintaining comparable potency and duration of sensory and motor blockade [6]. In ultrasound-guided supraclavicular brachial plexus blocks, 0.5% levobupivacaine provides effective intraoperative anaesthesia and postoperative analgesia; however, its duration is often limited (typically 8–12 hours for sensory blockade), prompting the investigation of adjuvants to prolong analgesia and reduce supplemental analgesic requirements [5-7].

Nalbuphine, a synthetic opioid of the phenanthrene series, functions as a κ-opioid receptor agonist and μ-opioid receptor partial antagonist. This mixed agonist-antagonist profile confers analgesia comparable to morphine for moderate-to-severe pain with a ceiling effect on respiratory depression, sedation, and euphoria, resulting in a superior safety margin, particularly regarding pruritus, nausea, and hemodynamic instability [8]. When used perineurally as an adjuvant in brachial plexus blocks, nalbuphine enhances block characteristics through multiple mechanisms: direct peripheral opioid receptor activation (upregulated in inflammatory states), axonal transport to central sites, modulation of spinal inhibitory pathways via serotonin uptake inhibition, and potential systemic absorption contributing to central analgesia [9-11].

Several clinical trials have demonstrated the efficacy of perineural nalbuphine in extending sensory and motor blockade duration when added to local anaesthetics such as bupivacaine, ropivacaine, or levobupivacaine in supraclavicular approaches [11]. For instance, Das et al. (2017) reported that 10 mg nalbuphine added to 0.5% levobupivacaine significantly prolonged sensory and motor block durations and time to first analgesic request without increasing adverse effects in ambulatory upper limb surgery [12]. Similarly, studies with bupivacaine or ropivacaine adjuvants have shown dose-dependent benefits, with 10 mg nalbuphine often outperforming lower doses or placebo in hastening onset and extending analgesia [11-13].

The optimal dose of nalbuphine for perineural use remains an area of active investigation, as higher doses may offer prolonged analgesia but raise theoretical concerns regarding side effects or local neurotoxicity, though clinical data generally support its safety at low doses (5–20 mg). Chiruvella et al. (2018) specifically compared 5 mg versus 10 mg nalbuphine with levobupivacaine in supraclavicular blocks, finding that the higher dose provided faster onset, longer sensorimotor blockade, and superior postoperative analgesia without significant hemodynamic changes or increased complications [13]. Other trials using 20 mg with lower concentrations of levobupivacaine have corroborated benefits but highlighted the need for dose optimisation to balance efficacy and safety [13, 14]. Despite these promising findings, comparative data on varying low doses (specifically 5 mg vs. 10 mg) of nalbuphine as an adjuvant specifically to 0.5% levobupivacaine under ultrasound guidance are limited, with variability in patient populations, surgical procedures, and outcome measures. Unresolved questions persist regarding the dose-response relationship for onset time, block quality, duration of analgesia, rescue analgesic needs, and incidence of side effects such as sedation or nausea in this context.

The present study aims to address this gap by comparing the effects of adding 5 mg versus 10 mg nalbuphine to 0.5% levobupivacaine in ultrasound-guided supraclavicular brachial plexus block for upper limb surgeries. The present study seeks to answer the research question: Does the addition of nalbuphine at doses of 5 mg and 10 mg to 0.5% levobupivacaine influence the efficacy and safety of ultrasound-guided supraclavicular brachial plexus block in patients undergoing elective upper limb surgery? The working hypothesis is that nalbuphine, when combined with levobupivacaine, will enhance block characteristics and postoperative analgesia in a dose-dependent manner, with 10 mg producing superior prolongation of sensory and motor blockade and analgesia compared to 5 mg, without increasing adverse effects. Accordingly, the study aims to compare onset times of sensory and motor blockade, assess the duration of blockade and postoperative analgesia, and evaluate perioperative hemodynamic changes, rescue analgesia requirements, and any complications between the two groups, thereby determining the optimal nalbuphine dose for clinical practice.

MATERIALS AND METHODS

Study Overview

This study was conducted as a prospective, double-blind, randomised controlled trial. The duration of the study extended over two years, allowing adequate recruitment and follow-up. The trial was carried out in the Department of Anaesthesiology at a tertiary care hospital of Bihar.

Study Population

Adult patients aged between 18 and 60 years of either sex, belonging to ASA physical status I or II, and scheduled for elective upper limb surgery under supraclavicular brachial plexus block were included. Patients were excluded if they declined participation, had coagulopathy or were on anticoagulants, had pre-existing brachial plexus neuropathy, known allergy to opioids or local anaesthetics, local infection at the injection site, or were on chronic analgesics, sedatives, or antipsychotics. Data were obtained from clinical records, intraoperative monitoring charts, and postoperative pain assessment scales.

Sample Size
A total of 60 patients were enrolled and randomised into two equal groups of 30 each. Group NB1 received 5 mg nalbuphine with levobupivacaine, while Group NB2 received 10 mg nalbuphine with levobupivacaine. The sample size was calculated based on the findings of Chiruvella et al. (2018) [13], which reported a mean analgesia duration of 698 minutes with nalbuphine. To detect a clinically significant difference with 95% confidence and 5% margin of error, a minimum of 29 patients per group was required. Recruiting 30 patients per group ensured adequate statistical power and reliability of results.

Intervention
Patients in Group NB1 received a mixture of 0.5 ml (5 mg) nalbuphine, 0.5 ml normal saline, and 20 ml of 0.5% levobupivacaine, whereas Group NB2 received 1 ml (10 mg) nalbuphine mixed with 20 ml of 0.5% levobupivacaine. All blocks were performed under ultrasound guidance using a high-frequency linear transducer (8–13 MHz) and a 23-G, 40 mm short-bevelled echogenic needle with the in-plane technique. The total volume of injectate was standardised across groups.

Outcome Parameters
The primary outcomes included onset and duration of sensory and motor blockade, as well as duration of postoperative analgesia. Secondary outcomes comprised perioperative hemodynamic changes (heart rate, blood pressure, SpO_2), requirement and timing of rescue analgesia, and incidence of adverse effects such as nausea, vomiting, bradycardia, hypotension, or respiratory depression.

Methodology
Patients were randomised using sealed opaque envelopes prepared by senior anaesthesiology staff, and allocation was revealed by an independent anaesthesiologist not involved in data collection, ensuring blinding. Preoperative evaluation included routine investigations and baseline monitoring. Standard intraoperative monitoring was applied throughout the procedure. The supraclavicular brachial plexus block was performed with the patient positioned supine and head turned contralaterally. Block efficacy was assessed using pinprick testing for sensory blockade and a motor function scale for motor blockade. Non-responsive blocks were excluded from analysis. Postoperatively, pain was assessed using a visual analogue scale (VAS, 0–10), and rescue analgesia was administered if VAS ≥ 4. Hemodynamic parameters and adverse events were recorded perioperatively and during follow-up.

Data Collection
Clinical data were collected prospectively using structured proformas, intraoperative monitoring charts, and postoperative pain assessment records. Pain scores, onset and duration of block, duration of analgesia, rescue analgesia requirements, and adverse events were documented systematically by trained staff blinded to group allocation.

Statistical Analysis
Data were entered into spreadsheets and analysed using GraphPad Prism version 8.4.3. Continuous variables such as onset and duration of block and analgesia time were expressed as mean ± standard deviation and compared between groups using Student's t-test. Categorical variables such as adverse effects and rescue analgesia requirements were analysed using the Chi-square test or Fisher's exact test as appropriate. A p-value less than 0.05 was considered statistically significant.

Ethical Consideration
The study protocol was reviewed and approved by the Institutional Ethics Committee. Written informed consent was obtained from all participants after explaining the procedure, potential risks, and benefits. Patient confidentiality was maintained throughout the study, and all procedures adhered to the principles of the Declaration of Helsinki and Good Clinical Practice guidelines.

RESULTS
The demographic characteristics were well-matched between both groups, confirming successful randomisation. Mean age (39.53 ± 12.43 vs. 39.55 ± 11.34 years), gender distribution (60% vs. 56.67% males), ASA status, and body weight showed no statistically significant differences ($p > 0.05$ for all parameters). This homogeneity ensures that observed outcome differences can be attributed to the intervention rather than confounding variables [Table 1].

Table 1: Baseline Demographic Characteristics of Patients

Variable	Group NB1 (n=30)	Group NB2 (n=30)	p-value
Age (years, mean ± SD)	39.53 ± 12.43	39.55 ± 11.34	0.9948*
Male Gender, n (%)	18 (60.0%)	17 (56.67%)	>0.9999**
ASA I/II	19 (63.33%)/ 11 (37.67%)	21 (70.0%)/ 9 (30.0%)	0.7847**

Weight (kg, mean ± SD)	64.51 ± 11.28	63.52 ± 12.17	0.7450*

**Unpaired t test; **Fisher's Exact Test*

The 10 mg nalbuphine group (Group NB2) demonstrated significantly superior block characteristics compared to the 5 mg group across all parameters. Onset times were faster for both sensory (8.59 vs. 10.57 min, $p = 0.0176$) and motor (14.57 vs. 17.87 min, $p < 0.0001$) blockade. Duration parameters were markedly prolonged with the higher dose: sensory block (611 vs. 517 min, $p < 0.0001$), motor block (575 vs. 485 min, $p < 0.0001$), and postoperative analgesia (827 vs. 696 min, $p < 0.0001$). These findings demonstrate a clear dose-dependent enhancement of block quality with 10 mg nalbuphine [Table 2].

Table 2: Comparison of Block Characteristics

Block Parameters	**Value in Minutes, Mean ± SD**		**p-value (Unpaired t-test)**
	Group NB1 (n=30)	Group NB2 (n=30)	
Onset Time of Sensory Block	10.57 ± 3.90	8.59 ± 2.12	0.0176
Onset Time of Motor Block	17.87 ± 2.60	14.57 ± 2.26	<0.0001
Duration of Sensory Block	516.86 ± 75.96	611.31 ± 75.90	<0.0001
Duration of Motor Block	484.91 ± 65.48	574.77 ± 63.41	<0.0001
Duration of Postoperative Analgesia	695.81 ± 104.21	827.07 ± 99.46	<0.0001

Rescue analgesia was required in 43.33% of Group NB1 patients compared to only 20.0% in Group NB2, representing a 23.33% absolute reduction. Although this difference did not reach statistical significance ($p = 0.0946$), the clinical importance is evident, as patients receiving 10 mg nalbuphine were less than half as likely to need supplemental analgesics. A larger sample size might establish statistical significance for this outcome [Table 3].

Table 3: Comparison of Requirements for Rescue Analgesia

Variable	**Number of Patients (%)**		**p-value (Fisher's Exact Test)**
	Group NB1 (n=30)	**Group NB2 (n=30)**	
Required	13 (43.33)	6 (20.0)	0.0946
Not Required	17 (56.67)	24 (80.0)	

VAS pain scores were comparable between groups at 2 hours (1.25 vs. 1.11, $p = 0.4514$), but Group NB2 consistently showed significantly lower scores from 4 hours onward ($p < 0.05$ at all timepoints). The differences progressively widened over time, with Group NB2 demonstrating superior pain control at 4, 6, 8, and 10 hours post-block. This pattern confirms the extended analgesic duration provided by the 10 mg dose [Table 4].

Table 4: Comparison of VAS Pain Score Between Groups

Timepoints	**VAS Score, Mean SD**		**p-value (Unpaired t-test)**
	Group NB1 (n=30)	**Group NB2 (n=30)**	
2 hr	1.25 ± 0.73	1.11 ± 0.70	0.4514
4 hr	2.54 ± 0.49	2.15 ± 0.74	0.0193
6hr	3.81 ± 1.05	3.23 ± 0.71	0.0150
8 hr	4.53 ± 0.55	3.92 ± 1.08	0.0078
10 hr	4.25 ± 0.47	3.70 ± 0.79	0.0018

The hemodynamic parameters remained stable and comparable between both groups throughout the perioperative period, with no clinically significant differences observed at any time point.

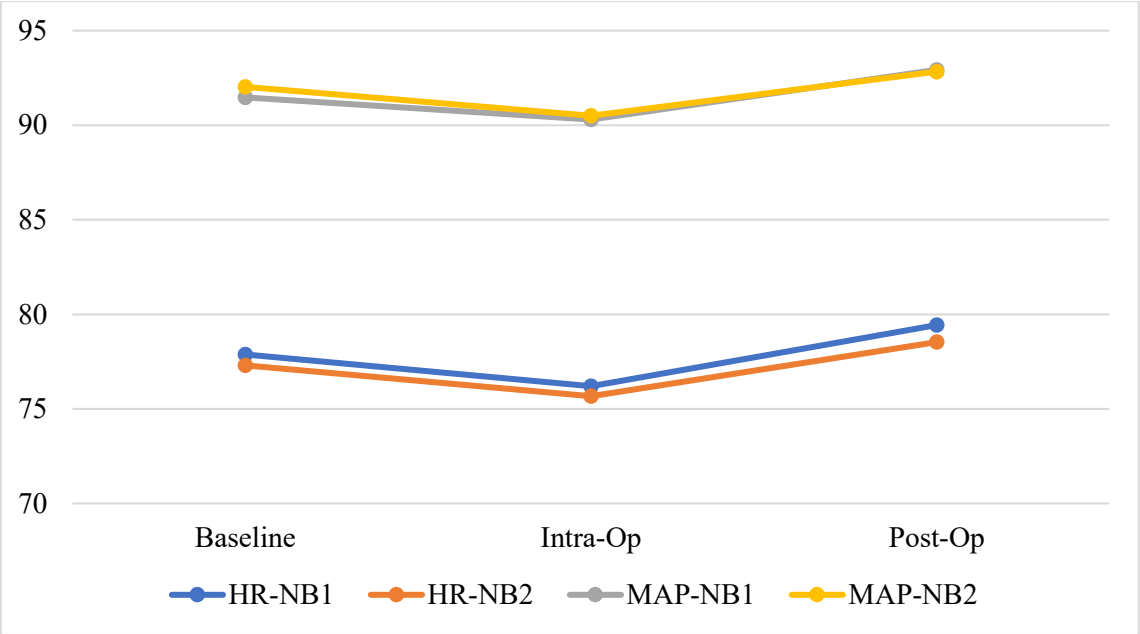

Figure 1: Comparison of Heart Rate (HR) and Mean Arterial Pressure (MAP)

Adverse effects were infrequent and comparable between groups, with no significant dose-dependent increase in complications. Nausea (6.7% vs. 10%), vomiting (3.3% vs. 6.7%), hypotension (3.3% in both groups), and bradycardia (0% vs. 3.3%) occurred at low rates. Critically, no respiratory depression was reported in either group. These findings confirm the safety of both nalbuphine doses, with the 10 mg dose providing superior analgesia without imposing additional significant risks.

Table 5: Comparison of Adverse Effects

Adverse Effects	Number of Patients (%)	
	Group NB1 (n=30)	Group NB2 (n=30)
Nausea	2 (6.7%)	3 (10%)
Vomiting	1 (3.3%)	2 (6.7%)
Bradycardia	0	1 (3.3%)
Hypotension	1 (3.3%)	1 (3.3%)
Respiratory Depression	0	0

DISCUSSION

The present study compared the effects of 5 mg versus 10 mg nalbuphine as an adjuvant to 0.5% levobupivacaine in ultrasound-guided supraclavicular brachial plexus block for upper limb surgeries. The results demonstrated that the 10 mg nalbuphine group (Group NB2) showed significantly faster onset of both sensory and motor blockade compared to the 5 mg group (Group NB1).

The finding of faster onset times with 10 mg nalbuphine compared to 5 mg aligns with the observations of Madhusudhanan et al. (2023) [15], who reported that 10 mg nalbuphine with 0.5% bupivacaine produced 36% faster sensory block onset and 16% faster motor block onset. Similarly, our results are consistent with Chiruvella et al. (2018), who demonstrated faster onset times with 10 mg nalbuphine compared to 5 mg when combined with 0.375% levobupivacaine [13]. The meta-analysis by Jiang et al. (2022), which included 19 RCTs and 1355 patients, also confirmed that perineural nalbuphine significantly shortened sensory block onset by a mean difference of 2.6 minutes, supporting our observation of accelerated blockade with the higher dose [16]. However, our findings differ somewhat from Jain et al. (2019), who reported no significant difference in onset time when 10 mg nalbuphine was added to 0.5% ropivacaine, suggesting that the effect on onset may vary with the specific local anaesthetic used [11]. The significant prolongation of both sensory and motor block duration with 10 mg nalbuphine compared to 5 mg strongly corroborates the findings of multiple previous studies. Aggarwal et al. (2021) similarly reported improved block duration with 10 mg nalbuphine added to 0.5% levobupivacaine, while Jain et al. (2019) found significantly prolonged sensory block duration (401.20 ± 19.96 vs. 387.60 ± 29.73 min, $p = 0.009$) and motor block duration (333.20 ± 20.94 vs. 323.00 ± 26.28 min, $p = 0.03$) with nalbuphine [11, 17]. Gupta et al. (2016) also reported enhanced sensory and motor block duration with 10 mg nalbuphine added to 0.5% bupivacaine [18]. Our finding of significantly prolonged postoperative analgesia with the 10 mg dose (827.07 ± 99.46 minutes) compared to the 5 mg dose (695.81 ± 104.21 minutes) is strongly supported by the literature. The duration achieved in our 10 mg group

is comparable to the 833.55 ± 141.6 minutes reported by Chiruvella et al. (2018) and the 649.78 ± 114.76 minutes reported by Abdelhamid and Omar (2018) with 20 mg nalbuphine and low-concentration levobupivacaine [13]. The meta-analysis by Jiang et al. (2022) confirmed significant prolongation of analgesia duration with a mean difference of 162.5 minutes [16]. Gupta et al. (2016) reported prolonged analgesia duration from 341.31 ± 21.42 minutes in the control group to 481.53 ± 42.45 minutes in the nalbuphine group [18]. Aggarwal et al. (2021) also demonstrated significantly lower 24-hour rescue analgesia requirements in the nalbuphine group (127.5 ± 34.96 mg diclofenac) compared to control (150 ± 37.5 mg, p = 0.000), indirectly confirming prolonged analgesia duration [17].

Although our study showed a clinically meaningful reduction in rescue analgesia requirement (43.33% in Group NB1 vs. 20.0% in Group NB2) that did not reach statistical significance (p = 0.0946), this trend aligns with the findings of Kabade et al. (2018), who reported reduced rescue analgesic requirements in both nalbuphine groups compared to control [19]. Aggarwal et al. (2021) found significantly lower rescue analgesia requirements with nalbuphine, while Kalika et al. (2020) demonstrated that patients receiving nalbuphine required less rescue analgesia compared to controls [17, 20].
The low incidence of adverse effects observed in both groups, with no significant dose-dependent increase in complications, aligns well with the existing literature. Abdelhamid and Omar (2018) also demonstrated that nalbuphine with low-concentration levobupivacaine provided comparable analgesia without increased motor block or significant adverse effects [14]. The stable hemodynamic parameters observed in both groups throughout the perioperative period, with no clinically significant inter-group differences, are consistent with the findings of Gupta et al. (2016), who reported no hemodynamic changes with nalbuphine. Chiruvella et al. (2018) similarly noted no significant hemodynamic changes between the 5 mg and 10 mg nalbuphine groups [13, 18].

The present study has several limitations. The relatively small sample size (30 patients per group) may limit the generalizability of findings and reduce statistical power for detecting differences in secondary outcomes such as rescue analgesia requirements. The study was conducted at a single tertiary care centre, which may limit external validity.

CONCLUSION

The present study demonstrates that the addition of 10 mg nalbuphine to 0.5% levobupivacaine in ultrasound-guided supraclavicular brachial plexus block provides superior block characteristics compared to 5 mg nalbuphine, including significantly faster onset times for both sensory and motor blockade, prolonged duration of sensory and motor blockade, extended postoperative analgesia lasting over 13 hours, lower VAS pain scores from 4 hours onward, and reduced rescue analgesia requirements, all without any clinically significant increase in adverse effects or hemodynamic instability, with no respiratory depression reported in either group.

REFERENCES

1. Ultrasound-Guided Supraclavicular Brachial Plexus Nerve Block [Internet]. New York: NYSORA; c2026 [cited 2026 Jun 23]. Available from: https://www.nysora.com/regional-anesthesia/techniques/ultrasound-guided-supraclavicular-brachial-plexus-block/
2. Chan VWS, Perlas A, Rawson R, Odukoya O. Ultrasound-guided supraclavicular brachial plexus block. Anesth Analg. 2003 Nov;97(5):1514-1517. doi: 10.1213/01.ANE.0000062519.61520.14.
3. Govender S, Möhr D, Tshabalala ZN, van Schoor A. A review of the anatomy and a step-by-step visual guide to performing an ultrasound-guided supraclavicular brachial plexus block. South Afr J Anaesth Analg. 2019 Jan 2;25(1):12-20. doi: 10.1080/22201181.2018.1553359
4. Raju PK, Coventry DM. Ultrasound-guided brachial plexus blocks. BJA Educ. 2014 Aug;14(4):185-191. doi: 10.1093/bjaceaccp/mkt059
5. Bajwa SJ, Kaur J. Clinical profile of levobupivacaine in regional anesthesia: A systematic review. J Anaesthesiol Clin Pharmacol. 2013 Oct;29(4):530-9. doi: 10.4103/0970-9185.119172.
6. Burlacu CL, Buggy DJ. Update on local anesthetics: focus on levobupivacaine. Ther Clin Risk Manag. 2008 Apr;4(2):381-92. doi: 10.2147/tcrm.s1433.
7. Shrivastava M, Bhalerao J, Borkar K, Wananje A. A study of Comparison of Ropivacaine and Levobupivacaine in Supraclavicular Brachial Plexus Blocks in a tertiary hospital in Central India. Eur J Cardiovasc Med. 2025 May;15(5):115-119. doi:10.5083/ejcm/25-05-22.
8. Larsen D, Maani CV. Nalbuphine. [Updated 2025 Apr 26]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2026 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK534283/
9. Zeng Z, Lu J, Shu C, Chen Y, Guo T, Wu QP, et al. A comparison of nalbuphine with morphine for analgesic effects and safety: Meta-analysis of randomized controlled trials. Sci Rep. 2015 Jun 3;5:10927. doi: 10.1038/srep10927
10. Cairo University. The Analgesic Efficacy of Perineural Nalbuphine as an Adjuvant to Bupivacaine in Ultrasound Guided Superficial Cervical Plexus Nerve Block for Thyroid Surgeries. A Double Blinded Randomized Controlled Trial. 2026 May 14 [cited 2026 Jun 23]. In: ClinicalTrials.gov [Internet]. Bethesda (MD): National Library of Medicine (US). 2000 -. Available from: https://www.trialx.com/clinical-trials/listings/315847/the-analgesic-efficacy-of-4/

11. Jain K, Sethi SK, Gupta S, Khare A. Efficacy of nalbuphine as an adjuvant to 0.5% ropivacaine for ultrasound-guided supraclavicular brachial plexus block in upper limb surgeries: A prospective randomized double-blind study. The Indian Anaesthetists Forum. 2019 Jul-Dec;20(2):82-88. doi: 10.4103/TheIAForum.TheIAForum_31_19
12. Das A, RoyBasunia S, Mukherjee A, Biswas H, Biswas R, Mitra T, Chattopadhyay S, Mandal SK. Perineural Nalbuphine in Ambulatory Upper Limb Surgery: A Comparison of Effects of Levobupivacaine with and without Nalbuphine as Adjuvant in Supraclavicular Brachial Plexus Block - A Prospective, Double-blinded, Randomized Controlled Study. Anesth Essays Res. 2017 Jan-Mar;11(1):40-46. doi: 10.4103/0259-1162.200225.
13. 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. Anesth Essays Res. 2018 Jan-Mar;12(1):135-139. doi: 10.4103/aer.AER_197_17.
14. Abdelhamid BM, Omar H. Nalbuphine as an adjuvant to 0.25% levobupivacaine in ultrasound-guided supraclavicular block provided prolonged sensory block and similar motor block durations (RCT). J Anesth. 2018 Aug;32(4):551-557. doi: 10.1007/s00540-018-2512-x.
15. Madhusudhanan ER, Vimal R, Harishprabhakaran D. Effect of nalbuphine as adjuvant to 0.5% bupivacaine in ultrasound-guided supraclavicular brachial plexus block. Int J Acad Med Pharm. 2023;5(4):246-50. DOI: 10.47009/jamp.2023.5.4.51
16. Jiang J, Xu C, Zhang D, Zhou C. Efficacy of nalbuphine as a local anesthetic adjuvant for brachial plexus block: a systematic review and meta-analysis. Pain Physician. 2022;25(9):E1339.
17. Aggarwal S, Kumari A, Gupta R. Twenty-four-hour Requirement of Rescue Analgesia after Upper Limb Surgery under Supraclavicular Brachial Plexus Block: A Role of Nalbuphine as an Adjuvant to Levobupivacaine. Curr Trends Diagn Treat 2021; 5(1):16-20. DOI: 10.5005/jp-journals-10055-0115
18. Gupta K, Jain M, Gupta PK, Rastogi B, Zuberi A, Pandey MN. Nalbuphine as an Adjuvant to 0.5% Bupivacaine for Ultrasound-Guided Supraclavicular Brachial Plexus Blockade. Indian J Pain. 2016;30(3):176-180. DOI: 10.4103/0970-5333.198024
19. Kabade SD, Sebastian S, Wilson E. A comparative study of the analgesic effect of two doses of nalbuphine as an adjuvant to bupivacaine in brachial plexus block. J Evolution Med Dent Sci. 2018;7(18):2235-2239. DOI: 10.14260/jemds/2018/503
20. Kalika P, Xue R, Zheng J, Xiao Y, Zhen M, Ran R. Efficacy of Nalbuphine as an Adjuvant to Ropivacaine in Ultrasound-guided Supraclavicular Brachial Block. Clin J Pain. 2020;36(4):267-72. DOI: 10.1097/AJP.0000000000000803.