e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2025; 17(12); 506-509

Original Research Article

Comparative study of Ropivacaine with Nalbuphine and Ropivacaine alone in PNS guided Supraclavicular Brachial Plexus Block

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Received: 01-09-2025 / Revised: 15-10-2025 / Accepted: 21-11-2025
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Conflict of interest: Nil

Abstract

Background: Though ropivacaine is less cardiotoxic and less neurotoxic and safer local anaesthetic as compared to bupivacaine, the duration of motor and sensory blockage is limited; hence, adjuvant to ropivacaine will be appreciated because it increases the duration of sensory and motor blockage.

Method: Out of sixty (60) adult patients undergoing upper limb surgical operation, 30 received 30 ml of 0.5% ropivacaine with 1 ml of normal saline, while another 30 (group N) received the same amount of ropivacaine with 1 ml of (equivalent to 10 mg) nalbuphine (adjuvant) for supraclavicular brachial plexus block.

Results: There was a significant p-value ($p<0.001$) in the comparison of both groups; duration of sensory and motor blockade and duration of analgesia were significantly prolonged in the ropivacaine adjuvant group as compared to ropivacaine alone group.

Conclusion: It is observed that ropivacaine and nalbuphine together are more efficient at prolonging sensory and motor blockade and postoperative analgesia as compared to ropivacaine alone without any extra side effects.

Keywords: Nalbuphine, Ropivacaine, Supraclavicular, Brachial plexus, sensory and motor blockade.

Introduction

Branchial plexus block (BPB) is a routinely performed regional anaesthetsia technique for surgeries involving the upper limb. Various anesthetic agents like ropivacaine, bupivacaine, and nalbuphine were used [1]. Ropivacaine is an amide local anesthetic having a differential blocking effect on motor and sensory nerve fibres. When compared with bupivacaine, it has reduced cardiotoxic effect and central nervous system toxicity [2]. Hence, Ropivacaine is an ideal option for regional anaesthesia and management of postoperative pain.

Nalbuphine is a semisynthetic mixed agonist/antagonist opioid modulator of the phenanthrene or morphine series. It is structurally related to opioid antagonists like naloxone and naltrexone and to the potent opioid analgesic oxymorphone. Nalbuphine binds with high affinity to the μ-opioid receptors and k-opioid receptors (mixed k-agonist, μ-antagonist) [3], but it has a ceiling effect on respiration [4]. Hence, an attempt is made to compare the use of ropivacaine alone and ropivacaine mixed with nalbuphine in supraclavicular brachial plexus block, and the efficacies of both groups were evaluated.

Material and Method

60 adult patients admitted for orthopaedic surgery at the GMERS Medical College hospital in Navsari, Gujarat-396445, were studied.

Inclusion Criteria: Patients with ASA I and II of both sexes aged between 20-60 years. The patients who gave their consent in writing for the study were selected.

Exclusion Criteria: Patients with ASA 3, 4, and 5 known to have contraindications to nalbuphine hydrochloride, ropivacaine, uncontrolled diabetes, hypertension, renal or cardiopulmonary abnormality, bleeding diathesis, and local skin site infection and patients on antidepressant treatment were excluded from the study.

Method: 60 (sixty) patients were divided into two groups of thirty each. Group R (30) received an injection of ropivacaine 0.5% (30 ml) with normal saline 1 ml, making a total of 31 ml, whereas group N (30) received an injection of ropivacaine 0.5% (30 ml) with nalbuphine 10 mg (1 ml), making a total of 31 ml. Benefits and likely complications of the techniques used were explained to the patients and their caretakers in their local language.

Every patient underwent a thorough pre-anaesthetic checkup, general examination, systemic examination, and routine investigations. The day before the surgery, the patient was kept nil by mouth. On the day of surgery, an IV line was secured, and dextrose normal saline (DNS) was started. ECG (electrocardiogram), non-invasive blood pressure (NIBP), and pulse oximeter were applied. Baseline parameters like pulse rate (PR) and systolic and diastolic blood pressure. Mean blood pressure (MBP), SPO2, and pain score were recorded. Premedication Injection ondansetron (0.08 mg/kg) IV, injection of ranitidine (1 mg/kg) IV, and midazolam (0.04 mg/kg) IV were given. The classical technique was used for performing brachial plexus blockage through the supraclavicular approach. Local infiltration with plain 2% 2cc lignocaine was given to minimize needle pain. A 22G 5 cm insulated needle with a nerve stimulator was directed just above and posterior to the subclavian arterial pulse and directed caudally at a very flat angle against the skin until the flexion of the finger was noted. After negative aspiration for blood, 31 ml of the respective drug was injected depending on whether the patient was allotted to either group R or N. Pulse rate, blood pressure, and oxygen saturation were recorded before the procedure and thereafter every 5 minutes after the administration of the block till half an hour and then every 15 minutes till the end of the procedure and Postoperatively. simultenously the patient was monitored intraoperatively and postoperatively for numerical rating scale (pain) score and any complications like nausea, vomiting, chest pain, coughing, convulsions, hypotension, and bradycardia.

Sensory block was assessed every 3 minutes, and motor block was assessed at every 5-minute interval for the initial 30 minutes and after 12 hours post-block and every 60 minutes until complete recovery. The onset of sensory block was assessed by a pinprick test in areas innervated by the radial, ulnar, and median nerves and compared with the same stimulation on the opposite upper limb. A sensory block was graded as 0-sharp pain, grade I touch sensation only, and grade II no sensation. Onset time will be defined as a dull sensation on any nerve distribution. Sensory peak effect time is defined as complete loss of sensation along the nerve distribution. Total duration of sensory blockade is defined as the time interval between injection of the drug and complete recovery of sensation.

Similarly, the onset of motor block was evaluated by asking the patient to move the forearm against resistance and to flex the forearm. Motor block is assessed by the Bromage scale: Normal motor function, decreased motor strength with the ability to move the finger only, a complete motor block with the inability to move the fingers. Onset time will be considered when the patient felt heaviness on abduction of the arm at the shoulder. Motor peak effect time is the absence of any voluntary movement at the level of the arm and forearm. Total duration of motor blockade is defined as the time interval between injection of drug and complete recovery of motor power. Tourniquet inflation and deflation time and duration of surgery were noted. Analgesia was considered satisfactory if the score was 3 or less. If the score was more than 4, analgesia was judged unsatisfactory, and rescue analgesia was administered in the form of an injection of diclofenac sodium, and the time for the first analgesia was noted. Both groups were compared for total duration of analgesia.

In the present study, the primary outcome measure was duration of analgesia; secondary measures were onset and duration of sensory and motor blockade, pain scores, and evidence of any adverse drug reactions.

The duration of the study was from November 2024 to October 2025.

Statistical Analysis: Various profiles of patients of both groups' blockades durations were compared with a t-test, and significant values were noted. The statistical analysis was carried out using SPSS software.

Observation and Results

Table 1: comparison of characteristic of profile in both groups

- Age (years): 36.6 (± 8.2) in group R, 33.5 (± 9.8) in group N, t test was 1.32 and p>0.18 (p value is insignificant).
- Weight (Kg): 56.4 (± 3.05) in group R, 57.2 (± 4.30) in group N, t test was 0.83 and p>0.40 (p value is insignificant).
- Duration of surgery (in minutes): 72.6 (± 4.8) in group R, 78.5 (± 5.3) in group N, t test was 4.5 and p<0.001 (p value is highly significant).

Table 2: Comparison of onset duration of sensory and motor blockade analgesic in both groups

- Onset of sensory block (in minutes): 6.02 (± 0.80) in group R, 4.94 (± 0.72) in group N, t test was 5.42 and p<0.001 (p value is highly significant).
- Onset of motor block (in minutes): 10.20 (± 1.11) in group R, 8.92 (± 0.78) in group N, t test was 5.16 and p<0.001 (p value is highly significant).
- Duration of sensory block (in minutes): 392.25 (± 20.1) in group R, 4.88 (± 25.2) in group N, t test was 16.3 and p<0.001 (p value is highly significant).
- Duration of motor block (in minutes): 332.70 (± 22.60) in group R, 438.88 (± 42.3) in group

N, t test was 13.3 and p<0.001 (p value is highly significant).

- Duration of analgesia (in minutes): 448.60 (± 23.8) in group R, 550 (± 23.8) in group N, t test was 17.5 and p<0.001 (p value is highly significant).

Table 1: Comparison of characteristic profile of patients in both groups

Details	Group R (30)	Group N (30)	t test	p value
Age (in years)	36.6 (± 8.2)	33.5 (± 9.8)	1.32	p>0.18
Weight (in kg)	56.4 (± 3.05)	57.2 (± 4.30)	0.83	p>0.40
Duration of surgery	72.6 (± 4.8)	78.5 (± 5.3)	4.5	P<0.001

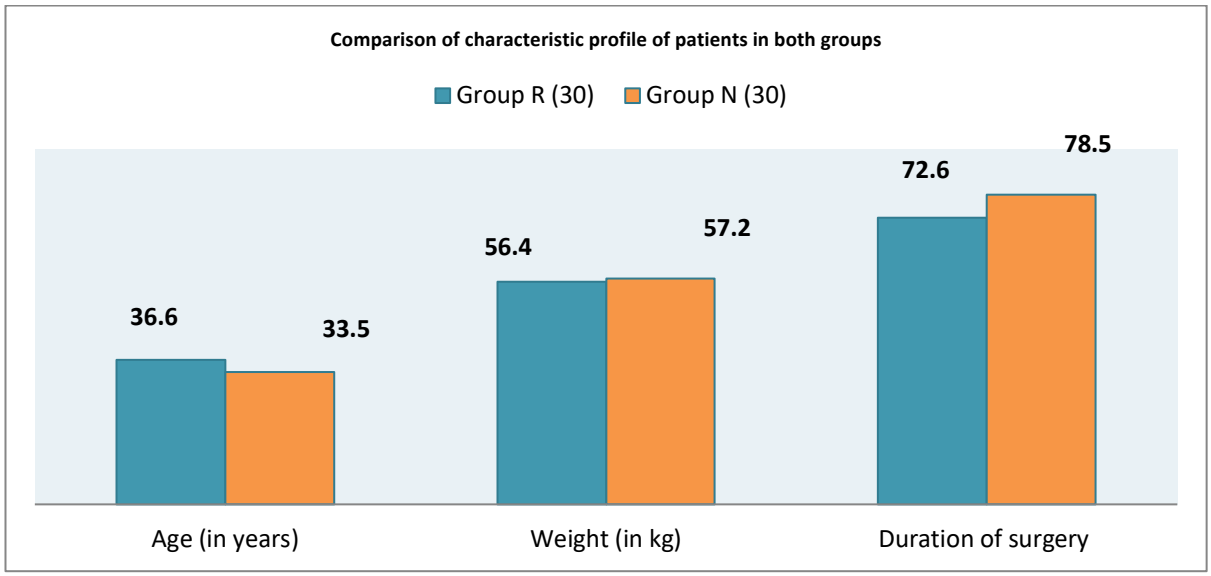

Figure 1: Comparison of characteristic profile of patients in both groups

Table 2: Comparative study of onset, duration of motor block, sensory block analgesia in both groups

Parameters	Group R (30)	Group N (30)	t test	p value
Onset of sensory	6.02 (± 0.80)	4.94 (± 0.72)	5.42	P<0.001
Onset of motor block (minutes)	10.20 (± 1.11)	8.92 (± 0.78)	5.16	P<0.001
Duration of sensory block (minutes)	392.25 (± 20.1)	488.6 (± 25.2)	16.3	P<0.001
Duration of Motor block (minutes)	332.70 (± 22.60)	438.88 (±42.3)	13.3	P<0.001
Duration of analgesia	448.60 (±23.8)	550 (± 20.81)	17.5	P<0.001

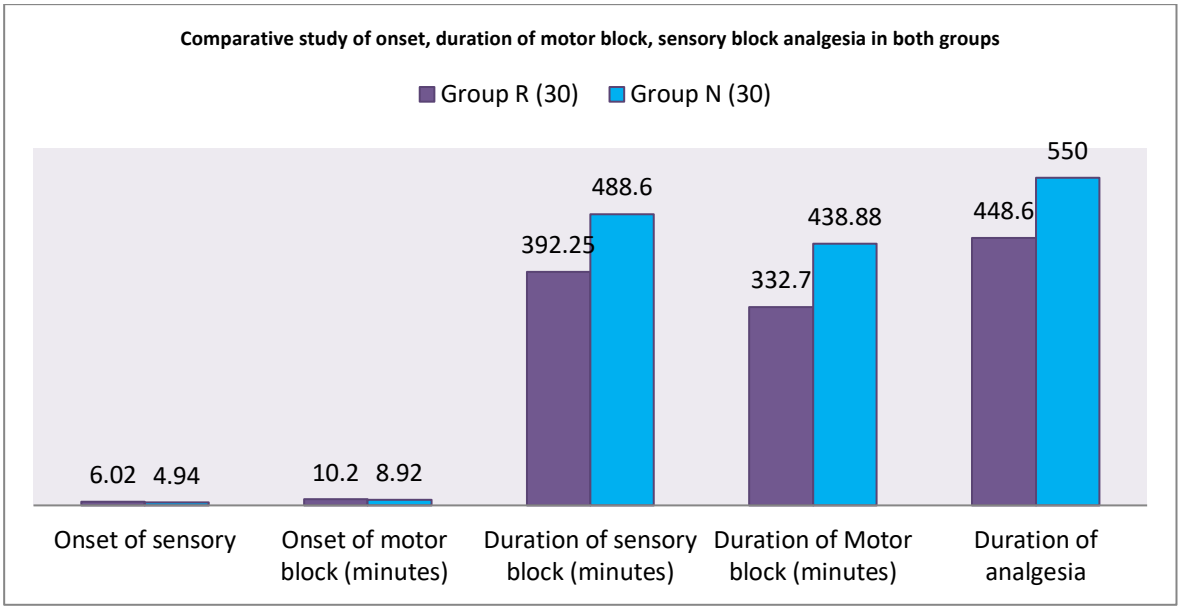

Figure 2: Comparative study of onset, duration of motor block, sensory block analgesia in both groups

Discussion

Present comparative study of ropivacaine with nalbuphine and ropivacaine alone in PNS-guided supraclavicular brachial plexus block. In comparison of age group, weight of the patient, were more or less same hence the p value was insignificant ($p>0.18$), but duration was surgery was more prolonged in group N than group R hence p value was highly significant ($p<0.001$) (Table 1).

In a comparative study of the duration of analgesia, the sensory motor block was more prolonged in group N; hence, all parameters have a significant p-value ($p<0.001$) (Table 2). These findings are more or less in agreement with previous studies [5,6,7].

Opioids, when given perineurally, act on the peripheral nervous system (PNS) due to possible centripetal axonal transport of opioids. Preferred opioids for postoperative analgesia are those that lead to minimal side effects, including respiratory depression, sedation, pruritus, nausea, and vomiting, without compromising on pain relief [8].

Nalbuphine is a mixed k-agonist/ μ-antagonist opioid with a moderate analgesic effect with a respiratory ceiling effect. The ease of availability, cost-effectiveness, enhanced analgesia, and almost negligible respiratory depression with nalbuphine make it more satisfactory for day care surgeries than other opioids.

Nalbuphine has been used safely via various routes (intrathecal, epidural, and intravenous) without any report of neurotoxicity in several studies [9].

Nalbuphine can be used as an adjuvant to levobupivacaine 10 mg or 20 mg; different studies reported that in brachial plexus blockage of forearm and hand surgeries, it had no significant adverse effects [10].

Hence, it is widely used as an adjuvant to local anesthetics in central neuraxial techniques by epidural, caudal, and intrathecal routes also [11].

It has been hypothesized that opioids act directly on the peripheral nervous system due to possible centripetal axonal transport by opioids into the substantia gelatinosa after perineural injection.

Summary and Conclusion

Nalbuphine enhances the potency of ropivacaine and prolongs the sensory-motor blockage and analgesia; hence, intraoperative and postoperative pain management was quite successful.

Such studies must be carried out in a large number of patients to confirm the present significant findings and results.

Limitation of study: Owing to remote location of research centre, small number of patients and lack of latest techniques, we have limited finding and results.

This research work was approved by the ethical committee of GMERS Medical College hospital Navasari, Gujarat-396406.

References

1. Murphy DB, MC Cartney CJ, Chan VW: Novel analgesic adjuncts for brachial plexus block: A systemic review Anesth Analg. 2000 May 90(5):1122-8.
2. Ahmed, Faeed and Narulla, Hunny: A comparative study of three different doses of nalbuphine as an adjuvant to intrathecal bupivacaine for postoperative analgesia in abdominal hysterectomy. Indian J. of Pain. 2016, 30; 23.8.
3. Gunion MW, Marchionne AM: Use of the mixed agonist-antagonist nalbuphine in opioid-based analgesia, Acute pain. J. 2004, 6; 29-39.
4. Das A, RoyBasunia S: Perineural nalbuphine in ambulatory upper limb surgery. A prospective study, Anaesthesia Essays and Researches 2017, 11; 40-6.
5. Gupta K, Jain M: Nalbupine as an adjuvant to 0.5% Bupivacaine for ultrasound-guided supraclavicular brachial plexus blockade. Indian J. of Pain 2016, 30; 176-80.
6. Abdelhaq MM, Elramely MA: Effect of nalbuphine as an adjuvant to bupivacaine for ultrasound-guided supraclavicular brachial plexus block open J. Anaestheol. 2016, 6; 20-6.
7. McClellan KJ, Faulds D: Ropivacaine: An update of its use in regional anesthesia Drugs 2000, 60; 1065-93.
8. Kohli S, Kaur M: Brachial plexus block comparison of two different doses of clonidine added to bupivacaine J. Anaesth. Clin. 2013, 29; 491-5.
9. Santhosh Kumar Urmila Palaria, comparative evaluation of ropivacaine and ropivacaine with dexamethasone in supraclavicular brachial plexus block for postoperative analgesia Anaesth. Essays and Res. 2014, 8 (2); 202-208.
10. Qazi Ehson Ali, Manjunatha: Efficacy of clonidine as an adjuvant to ropivacaine in supraclavicular brachial plexus block—A prospective study Indian J. Anaesth. 2014, 58 (6); 709-713.
11. Kalyani Nilesh Patil and Noopur Dasmit Singh: Clonidine as an adjuvant to ropivacaine-induced supraclavicular brachial plexus block for upper limb surgeries. J. Anaesth. Clin. Pharmacol. 2015, 31 (3); 365-369.