*Original Research Article*

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# Effects of Adding Tramadol and Nalbuphine with Ropivacaine among Patients Undergoing Upper Limb Orthopedic Surgeries in A Tertiary Care Hospital

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**Abstract**

*Background:* Brachial plexus block is the widely-used nerve block in anesthesia for upperlimb surgeries. Ropivacaine, a newer local anesthetic with less cardiotoxicity used frequently now-a-days. Adding adjuvants increases the quality of the block and duration of analgesia. *Aims of the study:* Aim of the study is to compare the effects of adding 100 mg Tramadol and 10 mg Nalbuphine to 0.5% Ropivacaine in Supraclavicular brachial plexus block in patients undergoing upperlimb orthopedic surgeries. Also, study the block characteristics and complications during the study. *Materials and Methods:* A prospective randomized control study was conducted on, 60 ASA I/II patients of either sex at 20–50 years of age, undergoing upperlimb orthopedic surgeries. Group RT received 32 ml of drug mixture (30 ml 0.5% Ropivacaine plus 2 ml of Tramadol), whereas Group RN received 32 ml of the mixture (30 ml of 0.5% Ropivacaine plus 10 mg of Nalbuphine). Time of onset and duration of sensory and motor blocks, duration of analgesia, time for first rescue analgesia and a total number of doses of rescue analgesia were monitored and recorded. *Results:* Onset of sensory block, motor block in Group RT (8.82 ± 2.2 and 9.45 ± 0.5) was statistically faster than Group RN (11.45 ± 2.1 and 12.23 ± 1.2) respectively. The total duration of sensory and motor block was significantly more in Group RN than Group RT. The time of first rescue analgesia was significantly longer in Group RN (18.12 ± 1.2) than RT (14.32 ± 3.3). The total dose of rescue analgesia was statistically insignificant among the groups (2 *vs* 2). 5 patients in Group RT developed nausea and vomiting. ***Conclusion:*** The addition of Tramadol fastens the onset of sensory and motor blocks but the addition of Nalbuphine produces a longer duration of sensory and motor blocks with negligible complications.

**Keywords:** Ropivacaine; Tramadol; Nalbuphine; Brachial Plexus Block.

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## Introduction

Brachial plexus block is the widely-performed nerve block for surgeries distal to shoulder. Among all approaches, the supraclavicular approach is widely used and associated with a high success rate and fewer complications. Here nerves blocked at the level of trunks. They provide adequate anesthesia and through this, we can avoid unwanted effects of anesthetic drugs

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and hemodynamic effects of laryngoscopy and intubation.[1,2] Action of local anesthetics is short-lived so there are so many additives that can increase the duration of anesthesia and decrease the need for postoperative analgesia.Clonidine, Dexmedetomidine, opioids, dexamethasone, midazolam and magnesium sulfate. Due to its easy availability, among opioids, tramadol has been widely used as an adjuvant to local anesthetics. Another opioid Nalbuphine is gaining popularity now-a-days. It is an agonist-antagonist opioid (agonist at kappa receptors and antagonist at mu-receptor). Nalbuphine has equal potency as morphine in analgesia[3] Ropivacaine has been used in brachial plexus blocks as bupivacaine provides prolonged motor blockade and has cardiovascular toxicity. There are very few studies have been done on ropivacaine.[4] As far as our knowledge there was no previous study has compared these two drugs in supraclavicular brachial plexus block. So, in this prospective study, we are comparing the effects of adding tramadol and nalbuphine to 0.5% ropivacaine on block characteristics and the requirement of postoperative analgesia.[5]

## Materials and Methods

After getting institutional ethical committee approval and informed written consent from the patients, Totally of 60 ASA I and II patients in the age group of 20–50 years who were posted for elective upperlimb procedures were selected for the study. Those patients with allergic to any of the study drugs, respiratory, liver, renal diseases, coagulopathy, obese patients and infection at the local site were excluded from the study. Obviously, whoever not willing to participate and patients with failed blocks were excluded. The patients have divided into Two Groups ($n$ = 30) *Group RT:* Receives 30 ml of 0.5% Ropivacaine with 100 mg of Tramadol – the total volume of 32 ml. *Group RN:* Receives 30 ml of 0.5% Ropivacaine with 10 mg of Nalbuphine (1 ml drug with 1 ml normal saline) – the total volume of 32 ml. Patients were divided into two groups based on a computer-generated random number table. All patients were educated about the Numerical Rating Scale for postoperative pain[11] during preoperative visits. (0 = no pain, 1–3 = mild pain, 4–6 = moderate pain and 7–10 = severe pain). All patients were given 6 hours fasting and Tablet Ranitidine 150 mg and tablet alprazolam 0.5 mg night before surgery. After arrival into OR all patients attached with standard ASA monitors (Pulse oximeter, NIBP, ECG, RR, and temperature). Baseline vitals have been documented. IV cannula of 18 G was secured on the contralateral limb and started with a lactated ringer solution at the rate of 100 ml per hour. Under strict aseptic precautions with proper painting and draping with head turned to 45-degree opposite side, supraclavicular brachial plexus block was performed with electrical nerve stimulator B BRAUN with Stimuplex 5 cm insulated 22 G needle. Landmark was 2 cm above the midclavicular point and just lateral to the scalenus anterior muscle. The set frequency was 1 Hz and the starting current was 2 mA. The needle was directed caudally and posteromedial direction, Once motor response on the forearm and hand the frequency decreases gradually to 0.5 mA. if response persists study drug was given per their group allocation after negative aspiration of blood. Drug solution preparation and performance of block were done by different anesthesiologists who were not involved in the study. The injected area was gently massaged to improve the uniform spread of the drug. After the block, the onset of the block was tested every 2 minutes until a complete block occurs or till 30 minutes. Sensory block was assessed with cold sensation method over distribution of median, radial, ulnar and musculocutaneous nerves. Onset defined as the time interval between the injection of a drug to achieve a sensory loss of Grade 2. The time interval between the injection of a drug to the requirement of the first analgesia was defined as the duration of sensory block. Motor block was assessed with the Modified Bromage Scale. Onset defined as the duration between the injection of a drug to a motor block of Grade 3. The duration of motor block was the time interval between the injection of a drug to complete motor recovery in the forearm and hand. Throughout the procedure heart rate, blood pressure was monitored and documented. Any incidents of bradycardia (HR < 60 bpm), tachycardia (HR > 100), hypotension (decrease in MAP > 20% of baseline), hypertensive episodes (increase in MAP > 20% of baseline) were documented. Other complications like nausea, vomiting, sedation, pneumothorax, hematoma, local anesthetic toxicity and respiratory depression were also documented. Sedation was assessed with a Ramsay sedation scale. Time to first rescue analgesia was time between injection of the block to the numerical rating scale of more than 4. Injection Paracetamol infusion was given at the dose of 15 mg/kg. Patients were asked for pain by using a numerical rating scale every hourly till 6 hours, 2$^{nd}$ hourly

till 12 hours and then every 4 hourly for the next 12 hours. The total analgesic requirement was also documented.

### *Statistical Analysis*

Time to first rescue analgesia was taken as a primary variable to measure the sample size. Based on the pilot study over 8 patients, with ropivacaine, we found the time to first rescue analgesia was 320 minutes. It was calculated that a minimum of 26 patients needed in each group with a confidence interval of 95%, 5% alpha error and power of the study was 80%. We took a sample size of 30 in each group to avoid any loss or exclusion of patients during the study. Statistical analysis was done by using SSPS software *version* 17.0. All data were documented as mean and standard deviations. Student's *t*-test was used to analyze demographic data. Onset, duration of sensory and motor block was analyzed by using the Chi-square test. The value is considered statistically significant when the *p* - value is < 0.05.

## Results

Table 1 shows, Patients on both RTand RN Groups were compared based on Age, Sex, Weight, ASA status and duration of surgery, ($p > 0.05$).

**Table 1:** Patients Characteristics (Values; Mean ± SD)

| Sl. No | Characteristics | Group RT | Group RN | *p* - value |
|---|---|---|---|---|
| 1 | Age (years) | 35.23 ± 4.41 | 37.21 ± 3.34 | 0.231 |
| 2 | Sex (M/F) | 17/13 | 16/14 | 0.062 |
| 3 | Weight (Kgs) | 70.01 ± 2.1 | 68 ± 3.4 | 0.143 |
| 4 | ASA (I/II) | 20/10 | 19/11 | 0.235 |
| 5 | Duration of surgery (Mins) | 92.2 ± 2.2 | 91.4 ± 3.3 | 0.324 |

Table 2 shows, the Onset of sensory block, motor block in Group RT (8.82 ± 2.2 and 9.45 ± 0.5) was statistically faster than Group RN (11.45 ± 2.1 and 12.23 ± 1.2). The total duration of sensory and motor block was significantly more in Group RN than Group RT. The time of first rescue analgesia was significantly longer in Group RN (18.12 ± 1.2) than RT (14.32 ± 3.3). The total dose of rescue analgesia was statistically insignificant among the groups (2 *vs* 2).

**Table 2:** Characteristics of the block

| Sl. No | Block characteristics | Group RT | Group RN | *p* - value |
|---|---|---|---|---|
| 1 | Onset of sensory block (mins) | 8.82 ± 2.2* | 11.45 ± 2.1 | < 0.05 |
| 2 | Onset of motor block (mins) | 9.45 ± 0.5* | 12.23 ± 1.2 | < 0.05 |
| 3 | Duration of sensory block (hrs) | 13.21 ± 2.1 | 16.31 ± 2.3* | < 0.05 |
| 4 | Duration of motor block (hrs) | 11.31 ± 0.3 | 14.32 ± 2.1* | < 0.05 |
| 5 | Duration of analgesia (hrs) | 14.32 ± 3.3 | 18.12 ± 1.2* | < 0.05 |
| 6 | Time to first rescue analgesic (hrs) | 15.12 ± 2.1 | 19.13 ± 1.3* | < 0.05 |
| 7 | Total number of a dose of rescue analgesia in 24 hours | 2 | 2 | 0.1342 |

Table 3 shows, 5 patients in RT developed nausea and vomiting. No other patients in either group developed any complications. Sedation scores were comparable to both the groups.

**Table 3:** Complications

| Sl. No | Complications | Group RT | Group RN | *p* - value |
|---|---|---|---|---|
| 1 | Nausea | 5 | 0 | < 0.05 |
| 2 | Vomiting | 5 | 0 | < 0.05 |
| 3 | Sedation (3 and above) | 0 | 0 | – |
| 4 | Pneumothorax | 0 | 0 | – |
| 5 | Hematoma | 0 | 0 | – |
| 6 | Local Anesthetic Toxicity | 0 | 0 | – |
| 7 | Respiratory Depression | 0 | 0 | – |
| 8 | Bradycardia | 0 | 0 | – |
| 9 | Hypotension | 0 | 0 | – |

Figs. 1 and 2, throughout the procedure, hemodynamic variables were comparable in both groups. None of the patients developed bradycardia or hypotension.

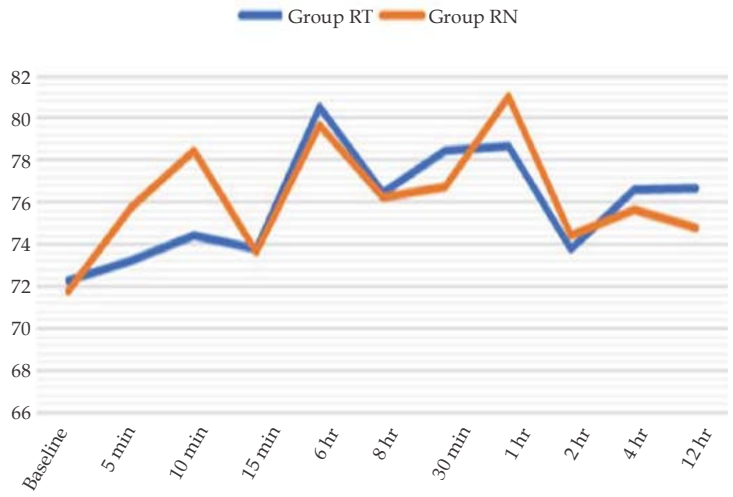


**Fig. 1:** Changes in mean heart rate.

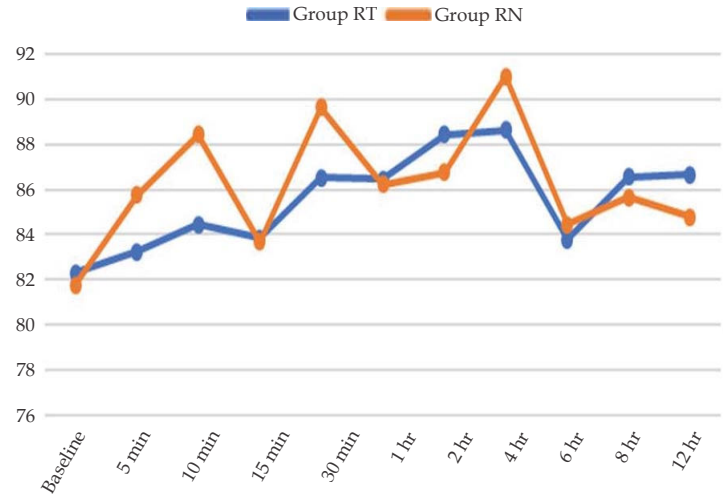


**Fig. 2:** Changes in mean arterial pressure.

## Discussion

Supraclavicular brachial plexus block is a widely used block for upperlimb surgeries. Local anesthetics used in the brachial plexus block provide adequate analgesia and relaxation for the surgery and it also prevents the need for laryngoscopy and endotracheal intubation. Thereby reduces the stress on the patient's cardiovascular system and it reduces surgical stress. It also avoids the drug's exposure to multiple systems.[6] Only local anesthetics do not produce longer analgesia so, there are some adjuvants that can increase the duration of analgesia and quality of the plexus block. It reduces the postoperative pain and need for analgesics. In our study, we compared Inj. Tramadol and Inj. Nalbuphine with 0.5% Ropivacaine in a supraclavicular brachial block in patients posted for upper limb orthopedic surgeries. Since, there was no direct comparison of these two drugs we could not provide direct references.[7] In our study, we monitored the onset and duration of sensory and motor blocks. The total duration of analgesia, time for first rescue analgesia and the total number of doses of rescue analgesia (Inj. Paracetamol 15 mg/kg). complications if any were also noted. Percentage of Ropivacaine, Doses

of Tramadol and Nalbuphine were selected from previous studies.[8] According to our study onset of the block both sensory and motor block was significantly faster in the tramadol group than the nalbuphine group. Sensory block onset was faster than motor onset. the onset of sensory and motor block was more in the nalbuphine group[9] Das A et al. compared plain ropivacaine and ropivacaine with nalbuphine, in this study addition of nalbuphine didn't add any advantage in the onset of the block with 0.5% ropivacaine. The duration of sensory and motor block was significantly higher in the nalbuphine group than the tramadol group.[10] Krebs EE et al. compared but orphanol and tramadol with levobupivacaine, they found that 2 mg of but orphanol provides longer duration of sensory and motor block when compared to 100 mg tramadol with minimal side effects[11] Kothari D et al. found that addition of nalbuphine prolongs the duration of sensory and motor blocks when used along with 0.5% Ropivacaine except for Eledjam JJ et al. who used 0.75% instead of 0.5% which was the concentration of Ropivacaine in our study. Duration of analgesia (14.32 ± 3.3 *vs* 18.12 ± 1.2) and time for the first rescue analgesia (15.12 ± 2.1 *vs* 19.13 ± 1.3) were significantly higher with nalbuphine group than tramadol group. The total number of doses of rescue analgesia was similar in both groups. 5 patients in the Tramadol group developed nausea and vomiting which was statistically significant. There was no pneumothorax, hemothorax, local anesthetic toxicity, respiratory depression, bradycardia, hypotension and over sedation.[12,13]

## Conclusion

Even though adding 100 mg Tramadol hastens the onset of supraclavicular brachial plexus block produced by 0.5% Ropivacaine, adding 10 mg of nalbuphine produces a better quality of the block and prolonged analgesia with fewer side-effects.

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***Conflicts of interest:*** Ethical committee clearance was given by the institution**.**

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