IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 18, Issue 11 Ser.7 (November. 2019), PP 45-49
www.iosrjournals.org

A Comparative study of varying doses of Nalbuphine 5mg vs10mg with Ropivacaine in Supraclavicular BrachialPlexus Block: A Prospective, Double-blind, Randomized Trial.

Dr.S.Tejaswi[1], Dr.M.Santhi sree[2].
1st Author: Dr.S.Tejaswi- Postgraduate in M.D(Anaesthesia), Department of Anaesthesia, Rangaraya Medical college, Kakinada(A.P)
Corresponding author: Dr.M.Santhi sree-Associate Professor, Department of Anaesthesia, Siddhartha Medical college, Vijayawada(A.P).

Abstract:
Background:
*This study was done to evaluate 5 mg vs 10 mg of nalbuphine added to 0.5% Ropivacaine, with regard to the duration of analgesia. Our study also aims to assess the onset and duration of sensorimotor blockade, hemodynamic effects, sedation, and adverse effects.**Methods**:Sixty adult patients undergoing forearm surgeries under supraclavicular brachial plexus block (using peripheral nerve stimulator) were randomly allocated into two groups. Group RN5 received 24.5ml of 0.5% Ropivacaine plus 5 mg of nalbuphine(0.5ml) i.e total 25ml . Group RN10 received 24ml of 0.5% Ropivacaine plus 10 mg of nalbuphine(1ml) i.e total 25ml.The Onset and duration of sensory block, motor block, hemodynamic variables, duration of postoperative analgesia, and adverse effects were recorded. The data were analyzed statistically using Students t-test and Chi-square test.**Results**:Onset of sensorimotor blockade and the duration of analgesia were significantly prolonged in Group RN10 compared to Group RN5 . Postoperative analgesia was significantly prolonged in Group RN10.*
***Conclusion**:A higher dose of nalbuphine in brachial plexus block fastens the onset, and increases the duration of sensory block, motor block and analgesia, without any significant side effects.*
***Keywords**: Supraclavicular, brachial plexus, nalbuphine, adjuvant.*

Date of Submission: 05-11-2019 Date of Acceptance: 20-11-2019

I. Introduction

Brachial plexus block (BPB)[1] is a routinely performing regional anaesthesia technique for surgeries involving below mid-arm orthopaedic procedures. Local anaesthetics[2] alone for supraclavicular BPB provide good intraoperative conditions but produce a shorter duration of postoperative analgesia. Various adjuvants like epinephrine, morphine, pethidine, dexamethasone, clonidine, dexmedetomidine, butorphanol, and midazolam were added to local anaesthetics to prolong postoperative analgesia with variable results and advantages[3]. Recently, nalbuphine[3] was studied frequently as an adjuvant to local anaesthetics in spinal, epidural and the results of all studies conclude that nalbuphine is effective when used as an adjuvant to local anaesthetics in spinal, epidural, as it significantly prolongs the block duration[4][11].

Nalbuphine[3] is a semisynthetic mixed agonist/antagonist opioid modulator of the phenanthrene or morphinan series. It is structurally related to the 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).The analgesic effect of nalbuphine has been found to be similar to the analgesic effect of other opioids like morphine but it has a ceiling effect on respiration. The present study is conducted to evaluate the duration of analgesia of two different doses of nalbuphine, 5 vs 10 mg added to 0.5% Ropivacaine, in patients posted for forearm surgeries under supraclavicular BPB. Our study also aims to analyse the onset and duration of sensorimotor blockade, hemodynamic parameters, and adverse effects in both the groups.

II. Materials And Methods

Institutional ethics committee approval is obtained. Seventy adult patients with age between 20 and 60 years, undergoing elective orthopaedic surgeries of fixation of fractures forearm under supraclavicular Brachial plexus block in Government General Hospital, Kakinada, Andhra Pradesh, were randomized into two groups based on computerised randomization.

The exclusion criteria included patient refusal; American Society of Anaesthesiologists (ASA) physical status 3, 4, and 5; any known hypersensitivity or contraindication to ropivacaine and nalbuphine hydrochloride; pregnancy; uncontrolled diabetes and hypertension; hepatic, renal, or cardiopulmonary abnormality; bleeding diathesis; and local skin site infections. Patients with history of significant neurological, psychiatric, and neuromuscular disorders were also excluded from the study.

Each individual has been taken written informed consent who are willing to participate in the study. Preanesthetic check-up and routine investigations were done. Patients were kept under fasting for six hours. All patients were clinically examined and explained the whole procedure preoperatively. A 10-cm visual analog scale (VAS) (0, no pain and 10, worst pain imaginable) was also explained during the preoperative visit. Patients were divided into two groups randomly using computer generated randomisation. Random group assigned was enclosed in a sealed envelope to ensure concealment of allocation sequence. The sealed envelope was opened by an anaesthesiologist who was not involved in the study to prepare the drug solution according to randomization. The anaesthesiologist who is performing the block and monitoring the patient was blinded to the treatment group. Data is collected by the anaesthesiologist who was not aware of the group allocation. Patients were randomly divided into one of the two equal groups of thirty patients each, to receive either of the following: Group RN5 – received 24.5ml of 0.5% Ropivacaine plus 5 mg of nalbuphine (0.5ml) i.e. total 25ml. Group RN10 received 24ml of 0.5% Ropivacaine plus 10 mg of nalbuphine(1ml) i.e. total 25ml.

After shifting the patient into operation theatre, non-invasive monitors such as NIBP, oxygen saturation (SPO_2), and ECG were connected and their baseline values were recorded. Peripheral venous access was established using 18 G cannula. Supplemental oxygen was provided via Hudson's facemask at 4 L/min to all patients. All patients were given inj.midazolam 1mg intravenously before the block. A peripheral nerve stimulator was used with a Stimuplex© needle (B Braun 22G, 5 cm). After desired motor response of finger twitches with stimulating current of 0.2-0.4 mA (2 Hz, 0.1 ms duration), the local anaesthetic solution was injected in an incremental 5 ml boluses with intermittent aspiration. While injecting the LA we looked for any resistance on injection or pain on injection to rule out intraneural injection.

Sensory and motor blockades were assessed every 5 min after completion of injection till 30 min and then every 1hour after the end of surgery till first 12 hours, thereafter 2nd hourly until the block had completely lostOnset of sensory blockade was considered as the interval between the completion of injection and sensory blockade i.e. a score of 1 on pinprick response. Onset of motor blockade was considered as the interval between the completion of injection and complete motor paralysis of wrist and hand. The duration of sensory blockade was considered as the time interval between onset of sensory blockade and reappearance of pinprick response. The duration of motor blockade was considered as the time interval between onset of maximum motor blockade and complete movement of wrist and fingers. Duration of analgesia was considered as the time interval between onset of sensory blockade and the first dose of rescue analgesic given to the patient. Patients with sensory block of Grade 0 and 1 and motor block of Grade 0, 1, and 2 were considered as incomplete block and hence were excluded and converted to general anaesthesia.

Postoperative pain was assessed using Visual Analog Scale (0 – no pain to 10 − worst pain) every 2nd hourly till the block lasted. Postoperative vitals (heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and SpO_2) were recorded every 2 h for the first 6 h and thereafter every 4 h till the need for rescue analgesia. Rescue analgesia was given with injection diclofenac sodium 75 mg intramuscularly when VAS >3 cm. The number of diclofenac injections given to each patient during first 24 h of the postoperative period was recorded. The time between complete sensory block and first analgesic request was recorded as a duration of analgesia.

Patients were observed for any incidence of hypotension/hypertension, bradycardia/tachycardia, fall in peripheral SPO_2, nausea, vomiting, intraoperative and postoperative shivering, pruritus, or any other adverse effects and were managed according to clinical protocol.

Quantitative data were expressed as mean ± standard deviation, and qualitative data were expressed as numbers and percentages. Student's *t*-test was used as test of significance to find an association for quantitative data. The Chi-square test was used as test of significance to find association for qualitative data. $P < 0.05$ was considered statistically significant.

III. Results

Thirty patients in each group were enrolled for the study. A total of 60 patients were included in the study.Patients of both groups were comparable with regards to the demographic profile for age, sex distribution, ASA physical status, body mass index, and the duration of surgery [Table 1]. There was no statistical significance in baseline hemodynamic variables and type of surgeries between the two groups ($P > 0.05$). [Table 2] shows the type of fractures in the patients studied.

TABLE 1 : DEMOGRAPHIC DATA

VARIABLES	GROUP RN5 (n=30)	GROUP RN10 (n=30)	P VALUE
AGE (years)	39.6±11.83	38.03±12.05	0.6125
WEIGHT (kgs)	66.13±9.78	65.26±10.45	0.7404
HEIGHT (cm)	160.73±8.97	160.63± 9.26	0.8325
GENDER (male/female)	23/12	20/15	0.302
ASA (I/II)	30/5	32/3	0.541
MEAN DURATION OF SURGERY(min)	84.34±26.71	83.81± 27.71	0.9401

TABLE 2 : TYPES OF FRACTURES IN STUDY PARTICIPANTS

TYPE OF FRACTURE	GROUP RN5 (%)	GROUP RN10 (%)
Fracture both bones forearm	16 (45.71%)	14 (40%)
Fracture distal Radius	10 (33.33%)	11 (36.66%)
Galezzei fracture	4 (17.14%)	5(25.71%)

Values are expressed as number or percentage of type of fractures. P>0.05.

The sensory and motor block onset was significantly earlier in Group RN10 than in Group RN5. The mean sensory block onset time was11.78±1.30min in Group RN5 as compared to 9.33±0.96 min in Group RN10 (P = 0.0001). The mean motor block onset time was16.01±1.38min in Group RN5 as compared to 12.83±1.01min in Group RN10 (P =0.0001) [Table 3]. The duration of sensory block was significantly prolonged in Group RN10 (750.20±21.3min) when compared to Group RN5 (574.9±27.5min) (P = 0.0001). The duration of motor block was also significantly prolonged in Group RN10 (398.76±87.2min) when compared to Group RN5 (306.80±78.6min) (P = 0.0001) [Table 3]. The duration of analgesia was significantly prolonged in Group RN10 (858.60±126.9min) when compared with Group RN5 (667.56±125.8min) (P = 0.0001) [Table 3].

Perioperative hemodynamic parameters of blood pressure, HR, and ECG were stable. The respiratory rate and peripheral SPO2 were comparable between the groups. There was no complaints of difficulty in breathing or any clinical evidence of diaphragmatic palsy or pneumothorax in any patient.

[Table 4] shows the side effects encountered throughout our study, which indicates that Group RN10 suffered from slightly more incidence of nausea, vomiting, sedation, and pruritus, but it was statistically insignificant (P > 0.05) when compared with Group RN5. 12/30 patients (40%) in Group RN5 required diclofenac sodium injection as rescue analgesia, whereas 5/30 patients (16.66%) in Group RN10 required rescue analgesia in the first 24 h of postoperative period [P = 0.037; [Table 5].

TABLE 3 : BLOCK CHARACTERISTICTS IN EACH GROUP

PARAMETERS	GROUP RN5	GROUP RN10	P VALUE
Onset of sensory block (min)	11.78±1.30	9.33±0.96	0.0001
Onset of motor block (min)	16.01±1.38	12.83±1.01	0.0001
Duration of sensory block(min)	574.9±27.5	750.20±21.3	0.0001
Duration of motor block (min)	306.80±78.6	398.76±87.2	0.0001
Duration of analgesia (min)	667.56±125.8	858.60±126.9	0.0001

P <0.001 i.e. highly significant.

TABLE 4 : COMPARISON OF SIDE EFFECTS IN EACH GROUP

SIDE EFFECTS	GROUP RN5 (%)	GROUP RN10 (%)
Nausea	5 (16.66%)	8 (26.66%)
Vomiting	4 (13.33%)	6 (20%)
Sedation	5 (16.66%)	7 (23.33%)
Pruritis	1 (3.33%)	3 (10%)

TABLE 5 : RESCUE ANALGESIC REQUIREMENTS IN POSTOPERATIVE PERIOD

Number of diclofenac required in first 24h of postoperative period	GROUP RN5 (%)	GROUP RN10 (%)
Once injection	9 (30%)	5 (16.66%)
Twice injection	6 (20%)	4 (13.33%)
Thrice injection	2 (6.66%)	1 (3.33%)

IV. Discussion

The supraclavicular brachial plexus block is an effective regional anaesthetic technique used for upper arm surgeries as it has rapid-onset, predictable, and dense anaesthesia in comparison to other approaches due to compact arrangement of plexus at this location[1]. Various adjuncts are added to local anaesthetic in order to increase the efficacy and duration of block with minimizing the systemic adverse effects along with a reduction in total dose of LA at the same time[3].

Opioids when given perineurally[6][7], act on the peripheral nervous system 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, pruritis, nausea, and vomiting without compromising on pain relief[3]. Nalbuphine is a mixed k-agonist-μ-antagonist opioid with a moderate analgesic effect with respiratory ceiling effect[3]. The ease of availability, cost effectiveness, enhanced analgesia and almost negligible respiratory depression with nalbuphine making it more satisfactory for day care surgery than other opioids. Nalbuphine had been used safely via various routes like intrathecal[10][11][12], epidural, intravenously without any report of neurotoxicity in several studies.

Chiruvella et al.[13] compared 5 mg vs 10 mg of nalbuphine added to 0.375% levobupivacaine, with regard to the duration of analgesia in patients undergoing upper limb surgeries under supraclavicular brachial plexus block and they concluded that a higher dose i.e.10 mg of nalbuphine fastens the onset of blockade and prolongs the duration of sensory and motor blockade along with analgesia, without any significant side effects. Similarly, Gupta et al.,[14] also used 10 mg nalbuphine in their study safely without any significant adverse effects. Although Abdelhaq and Elramely[15] also used a quite higher dose of nalbuphine i.e. 20mg in their study for brachial plexus block in patients undergoing elective forearm and hand surgery, no significant adverse effects were noted apart from a significant increase in duration of analgesia. In our study, we compared 5mg and 10 mg nalbuphine as an adjuvant to local anaesthetic.

Although various studies have compared the effects of adding nalbuphine to various local anaestheticss such as lignocaine, bupivacaine, and levobupivacaine, only few studies have used ropivacaine[2] as a local anaesthetic in their study. The aims and objectives of this study were to assess the analgesic efficacy and safety of 5mg and 10 mg nalbuphine as an adjuvant to 0.5% 25 ml ropivacaine for PNS-guided supraclavicular brachial plexus block with regards to onset and duration of sensory and motor block, duration of analgesia, hemodynamic variations, and side effects.

In our study, the onset of both sensory and motor blockades were faster with the higher dose of nalbuphine (10 mg). Tiwari et al.[10] reported that the addition of nalbuphine to local anesthetic in intrathecal route produces earlier onset of sensory and motor blocks. They also found that higher dose of nalbuphine also hastens the onset of sensory and motor block compared with lower dose.

In our study ,the sensory and motor block onset was significantly earlier in Group RN10 than in Group RN5. The mean sensory block onset time was 11.78±1.30min in Group RN5 as compared to 9.33±0.96 min in Group RN10 (P = 0.0001). The mean motor block onset time was 16.01±1.38min in Group RN5 as compared to 12.83±1.01min in Group RN10 (P =0.0001) . The duration of sensory block was significantly prolonged in Group RN10 (750.20±21.3min) when compared to Group RN5 (574.9±27.5min) (P = 0.0001). The duration of motor block was also significantly prolonged in Group RN10 (398.76±87.2min) when compared to Group RN5 (306.80±78.6min) (P = 0.0001) . The duration of analgesia was significantly prolonged in Group RN10 (858.60±126.9min) when compared with Group RN5 (667.56±125.8min) (P = 0.0001). These results were very similar with Ahluwalia et al.[12] who reported that, in intrathecal route, sensory and motor blockades were significantly prolonged in nalbuphine-treated group while compared with control.

In our study, patients of RN10 Group required significantly less number of diclofenac sodium injection as rescue analgesia in first 24 h of the postoperative period than the patients of RN5 Group (P < 0.05). Mukherjee et al.[11] also observed that rescue analgesic requirement was significantly decreased with a higher dose of nalbuphine when administered intrathecally.

In our study, we have observed nausea, vomiting, sedation, and pruritus as side effects in both groups, but the incidence was quite comparable between the two groups (P > 0.05). Nausea and vomiting does not require any active management except increasing the fluid transfusion rate and intravenous administration of Inj.Ondansetron 4mg . Two patients in RN10 group and one patient in RN5 group suffered from vomitings. All the three patients were managed accordingly.Similarly, pruritus was also higher in RN10 group, but it was self-limiting.Mukherjee et al.[11] administered nalbuphine intrathecally (placebo, 0.2, 0.4, and 0.8 mg) for orthopedic surgery and observed that a few side effects like nausea&vomiting, pruritis, bradycardia, and respiratory depression were exclusively associated with the highest dose of nalbuphine, and hypotension was evident in all the groups which was probably due to spinal anaesthesia.

V. Conclusion

Finally, we do conclude that, during forearm surgeries, addition of 10 mg nalbuphine hydrochloride to 0.5% Ropivacaine solution in supraclavicular BPB when compared to 5mg hastens the onset time of sensory and motor block, prolongs the duration of sensory and motor blockades, and reduces the requirement of rescue analgesic in postoperative period without any appreciable side effect.

References

[1]. Neal JM, Gerancher JC, Hebl JR, Ilfeld BM, McCartney CJ, Franco CD, et al. Upper extremity regional anesthesia: Essentials of our current understanding, 2008. Reg Anesth Pain Med 2009;34:134-70. Back to cited text no. 1

[2]. Leone S, Di Cianni S, Casati A, Fanelli G. Pharmacology, toxicology, and clinical use of new long acting local anesthetics, ropivacaine and levobupivacaine. Acta Biomed 2008;79:92-105. Back to cited text no. 2

[3]. Murphy DB, McCartney CJ, Chan VW. Novel analgesic adjuncts for brachial plexus block: A systematic review. AnesthAnalg. 2000;90:1122–8.

[4]. Ahmed F, Narula H, Khandelwal M, Dutta D. A comparative study of three different doses of nalbuphine as an adjuvant to intrathecal bupivacaine for postoperative analgesia in abdominal hysterectomy. Indian J Pain. 2016;30:23–8.

[5]. 5.MAGA Halim - Al-Azhar Assiut Medical Journal, 2018 - azmj.eg.net Infraclavicular brachial plexus block using nalbuphine versus midazolam as adjuvants to bupivacaine in upper limb surgery Year : 2018 | Volume: 16 | Issue Number: 4 | Page: 386-391

[6]. Gunion MW, Marchionne AM, Anderson TM. Use of the mixed agonist-antagonist nalbuphine in opioid based analgesia. Acute Pain. 2004;6:29–39.

[7]. Z Zeng, J Lu, C Shu, Y Chen, T Guo, Q Wu, S Yao… - Scientific reports, 2015 - nature.com .A Comparision of Nalbuphine with Morphine for Analgesic Effects and Safety : Meta-Analysis of Randomized Controlled Trials

[8]. Das A, RoyBasunia S, Mukherjee A, Biswas H, Biswas R, Mitra T, et al. 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;11:40–6.

[9]. Nazia nazir and Shruthi Jain et.al Randomized Controlled Trial for Evaluating the Analgesic Effect of Nalbuphine as an Adjuvant to Bupivacaine in Supraclavicular Block under Ultrasound Guidance.Anesth Essays Res. 2017 Apr-Jun; 11(2): 326–329.

[10]. doi: 10.4103/0259-1162.194590

[11]. Tiwari AK, Tomar GS, Agrawal J. Intrathecal bupivacaine in comparison with acombination of nalbuphine and bupivacaine for subarachnoid block: A randomized prospective double-blind clinical study. Am J Ther. 2013;20:592–5.

[12]. Mukherjee A, Pal A, Agrawal J, Mehrotra A, Dawar N. Intrathecal nalbuphine as an adjuvant to subarachnoid block: What is the most effective dose? Anesth Essays Res. 2011;5:171–5.

[13]. Ahluwalia P, Ahluwalia A, Varshney R, Thakur S, Bhandari S. A prospective randomized double blind study to evaluate the effects of intrathecal nalbuphine in patients of lower abdominal surgeries under spinal anaesthesia. Int J Sci Stud. 2015;3:19–23.

[14]. 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;12:135-9. Back to cited text no. 14

[15]. 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;30:176-80. Back to cited text no. 15

[16]. [Full text]

[17]. Abdelhaq MM, Elramely MA. Effect of nalbuphine as adjuvant to bupivacaine for ultrasound- guided supraclavicular brachial plexus block. Open J Anesthesiol 2016;6:20-6. Back to cited text no. 16

Dr.M.Santhi sree. "A Comparative study of varying doses of Nalbuphine 5mg vs10mg with Ropivacaine in Supraclavicular BrachialPlexus Block: A Prospective, Double-blind, Randomized Trial." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no. 11, 2019, pp 45-49.