Original Research Article

A randomised clinical trial to compare the butorphanol and nalbuphine as adjuvants in ultrasound guided supraclavicular brachial plexus block

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Abstract

Background: Supraclavicular brachial plexus block provides complete anaesthesia for surgeries of upper limbs especially below the mid humerus. Using ultrasound for blocks not only increases the success rate but also reduces complications. With advent of opioid receptors, variety of opioid agents are used for postoperative analgesia via brachial plexus block. **Aim:** To compare the butorphanol versus nalbuphine for duration of postoperative analgesia in USG guided supraclavicular brachial plexus block. **Methodology:** The study was carried out in 40 patients aged 20-60yrs, ASA grade I & II of either gender, undergoing Upper limb surgeries via ultrasound guided supraclavicular brachial plexus block in each group. Injection Butorphanol 1mg (Group-I) and Inj Nalbuphine 10 mg (Group-II) were added to local anaesthetic. Onset of sensory and motor blockade, duration of blockade and occurrence of any complications were studied in both the groups. Visual Analogue Score was used to assess the postoperative analgesia. **Results:** In Group II (Nalbuphine) the duration of analgesia was 390 min±22 min whereas in Group I it is 280±16 min. **Conclusion:** Both drugs are potent analgesic in brachial plexus block, but Nalbuphine produces longer duration of postoperative analgesia than Butorphanol.

Key Word: Butorphanol, nalbuphine, ultrasound guided Supraclavicular Brachial Plexus Block, Postoperative analgesia.

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Received Date: 02/03/2019 Revised Date: 27/04/2019 Accepted Date: 03/06/2019
DOI: https://doi.org/10.26611/10151034

Access this article online

Quick Response Code:

Website: www.medpulse.in

Accessed Date: 07 June 2019

INTRODUCTION

Postoperative pain is a complex physiological reaction to tissue injury or stress due to surgical stimulus. Its manifestation of autonomic, psychological and behavioural responses results in unpleasant, unwanted sensory and emotional experience. Many patients continue to experience pain despite advances in knowledge of patho-physiology of pain, pharmacology of analgesics and development of effective techniques for post-operative pain control.[1] Brachial Plexus block provides adequate anaesthesia and post-operative analgesia for all the upper limb procedures. Supraclavicular brachial plexus block provides anaesthesia for surgeries around elbow, forearm and hand.[2,3] Using ultrasound guided block not only reduces the dose required for the block but also reduces the complications and increases the precision. With advent of opioid receptors, variety of opioid agents are used as adjuvants in brachial plexus block for post-operative analgesia.[4] Butorphanol, a synthetic opioid is seven times more potent than morphine.[5] Buprenorphine added to the local anesthetic solution for brachial plexus block prolongs post-operative analgesia as do the nalbuphine, butorphanol, tramadol, clonidine etc.[6, 7] Nalbuphine, an

How to site this article: Shivanand L K, Basavaraj Patil. A randomised clinical trial to compare the butorphanol and nalbuphine as adjuvants in ultrasound guided supraclavicular brachial plexus block. *MedPulse International Journal of Anesthesiology*. June 2019; 10(3): 178-181. http://medpulse.in/Anesthsiology/index.php

opioid agonist–antagonist, is used as adjuvant to local anaesthetic for various regional anaesthetic techniques due to its affinity to κ–opioid receptors to enhance the duration of analgesia. It is widely studied as an adjuvant to local anaesthetics in central neuraxial techniques by epidural, caudal and intrathecal routes.[12] The present study was conducted to assess the onset of blockade, safety and duration of post- operative analgesia between butorphanol and nalbuphine administered through ultrasound guided supraclavicular brachial plexus block.

METHODS

After ethical committee approval and written informed consent, Randomized clinical study was carried out on 80 ASA grade 1 & 2 patient aged 20-60 years, posted for upper limb surgeries. All the patients were randomly allocated into two groups so that each group consists of 40 patients each.

GROUP–I

Inj. Bupivacaine hydrochloride (0.5%) 20 ml
Inj. Butorphanol 1 mg

GROUP–II

Inj. Bupivacaine hydrochloride (0.5%) 20 ml
Inj. Nalbuphine 10 mg

Exclusion criteria: Patients allergic to local anaesthetics, bleeding disorders, infection at the site of block, uncontrolled diabetes and hypertension. In operating theatre standard monitoring including non-invasive blood pressure, pulse oxymetry and ECG were attached to the patient. Baseline systolic blood pressure, diastolic blood pressure, heart rate and spo_2 were recorded. An 20G i.v. cannula secured. Ultrasound machine SONOSITE-M TURBO is used for giving supraclavicular approach of brachial plexus block. Inplain technique was used and the block was performed by the experienced anaesthesiologists

Sensory block was assessed by pin prick method:

Grade 0= Sharp pain
1 = Dull sensation (Analgesia)
2 = No sensation (Anaesthesia)

Motor blockade was assessed by hand grip method

Grade 0= Normal grip strength.
1 = Paresis, reduced grip strength and heaviness felt in raising arm above head.
2 = Paralysis, no grip strength, and inability to raise arm above head.

Patients were monitored for hemodynamic variables such as heart rate, blood pressure and spo_2 every 15 min after the block intraoperatively and every 60 min post-operatively. All patients were observed for side effects like tachycardia, bradycardia, respiratory depression, hypotension, nausea, vomiting, itching, urinary retention and complications like intravascular injection, pneumothorax, hematoma, and post-block neuropathy in the intra and post-operative periods. Post operatively patients were observed for analgesia hourly till VAS scoreless then 4 or when patient demanded rescue analgesics. Injection paracetamol i.V given when patient demands. Duration of analgesia was noted as time taken until patient demanded analgesia or VAS score 4. Visual analogue scale was observed every hourly for 9 hrs. post operatively.

VAS (visual analogue scale)

0 1 2 3 4 5 6 7 8 9 10
No Pain worst pain

It is a 10 cm long slide ruler with "no pain" written at one end and "Maximum Pain" at the other. The patient slides the cursor along the ruler until it reaches the level that represents the intensity of his pain. The other side of ruler is graduated over 100 mm and gives the investigator a numerical measure of the pain. Post-operative pain relief was considered from the time of end of surgery to the time when analgesic was supplemented. The amount time, type and route of administration of analgesic was noted.

Statistical Analysis: At the end of study, all data is compiled and analyzed statistically using Diagrammatic representation. Descriptive data presented as mean ± SD and Continuous data are analyzed by paired/unpaired't' tests. Chi-square test to assess the statistical difference between the two groups.

RESULTS

There was no statistically significant difference between the demographic profile (age, sex ratio and body weight), baseline heart rate and mean arterial pressure of the two groups. The groups were also similar with regard to duration and type of surgery ($p>0.05$).

VAS score	Group-I (n=40)	Group-II (n=40)	P value
4 hrs.	26	0	
5 hrs.	37.44±14	20±0	0.028
6 hrs.	50.66±20	29.12±8.25	0.0011
7 hrs.	27.14±8.09	42.45±16.22	0.0306
8 hrs.	-	52.24 ± 22.14	

Table 1: Duration of Analgesia (VAS Score)

At the end of 6 hrs, Group I had VAS score of 50.66 ± 20, indicates moderate pain and analgesia required and in Group II had VAS score of 29.12 ± 8.25, it did not required analgesia. The difference is statistically significant. After 8 hrs, Group II had VAS score of 52.24 ± 22.14, thus they required rescue analgesia. Thus, Group I patients require rescue analgesia at the end of 5 hrs. While Group II patients required at the end of 8 hrs. Thus difference was statistically significant ($P < 0.05$). So Group II (nalbuphine) had longer duration of postoperative analgesia. Only 5 patients had vomiting in

butarphanol group whereas in Nalbuphine group two patients had vomiting. Pruritis was seen with two patients in butorphanol group.

DISCUSSION

Pain is an inevitable consequence of surgery. Cutting, tearing, stretching and burning of tissues during surgery produces intraoperative and post-operative pain. Pain is maximum with orthopedic surgery. If this surgical pain is not treated adequately, it may lead to de-arrangement in various body functions. So treating pain is necessary to reduce the post-operative morbidity and mortality.[8] C Dae Geun Jeon *et al* conducted a series: ultrasound-guided supraclavicular block in 105 patients received an ultrasound-guided supraclavicular block. 40 ml of 1% mepivacaine was injected without a muscle twitch or paresthesia. The groups were divided into two groups - Group A (n = 92, patients who had visible brachial plexus) and Group B (n = 13, patients whose brachial plexus can't be located). The Success rate of Group A (98.9%) was higher than that of Group B (84.6%) (P< 0.05). The overall success rate was 97.1%. All patients could be operated on under sedation. The time to onset of Group A (12.6 ± 4.4 min) was shorter than that in Group B (23.1 ± 5.1 min) (P < 0.05). The overall time to onset was 13.8 ± 5.5 min. There were no serious complications such as pneumothorax[15]. In our study, conducted block by using SONOSITE M TURBO which has highest success rate and without any complications. Peripheral nerve block given with Local anesthetic drugs produce analgesia, but to prolong duration of post-operative analgesia, many agents including variety of opioids have been used by various investigators. These include Morphine, Pethidine, Tramadol, Butorphanol, Nalbuphine and Buprenorphine. Primary afferent tissues (dorsal roots) have been found to contain opioid receptors. Opioids may diffuse from the brachial plexus sheath and then bind with opioid receptor at the dorsal horn. The evidence of axonal flow of various macromolecules suggested possible centripetal axonal transport of opioids into the substantia gelatinosa after perineural injections.[9,10] Brachial plexus block is accepted as mode of regional analgesia for upper limb surgeries. Supraclavicular block is a simple, easy to administer and economical technique. It provides anesthesia for surgeries around elbow, forearm and hand. With this technique, landmarks are easy to locate and tourniquet pain is better tolerated. . With advent of opioid receptors, variety of opioid agents is used for postoperative analgesia via brachial plexus block. In a study conducted by Gupta k *et al* Nalbuphine as an Adjuvant to 0.5% Bupivacaine for Ultrasound‑guided Supraclavicular Brachial Plexus Blockade the duration of postoperative analgesia was 481.53 ± 42.45 min in nalbuphine group and 341.31 ± 21.42 min in saline group, with statistically highly significant difference (*P* < 0.001).in our study is comparable in relation to postoperative analgesia which is 390 min.[17] Acharya *et al.* studied the effect of 2 mg butorphanol as an adjuvant to bupivacaine in supraclavicular nerve block to the patients scheduled for elective surgery upper limb and concluded that butorphanol prolongs the duration of brachial plexus block.[13] Abdelhaq and Elramely also used 20 mg nalbuphine as adjuvant to 25 mL of 0.5% bupivacaine for supraclavicular brachial plexus block for upper arm surgeries and concluded that nalbuphine has significantly increased the duration of both sensory and motor block along with prolonged postoperative analgesia.[14] In the present study, double-blinded trial, we compared butorphanol and nalbuphine as an adjuvant to local anesthesia mixture in supraclavicular brachial plexus block and found that nalbuphine group had delayed onset of sensory, motor blockade and longer duration of post-operative analgesia than butorphanol group. Wajima Z *et al*[10] have studied Inj. Butorphanol in local anesthetic via continuous brachial plexus block and have demonstrated that Butorphanol produces prolonged pain relief in postoperative period. So here, in our study we have used Inj. Butorphanol 1mg v/s Inj. Nalbuphine 10mg in addition to local anesthetic drugs via supraclavicular brachial plexus block. In our study, postoperatively comparison of duration of postoperatively analgesia was done by visual analogue scale score (VAS score) and showed statically significant prolonged duration of analgesia in Group-II Nalbuphine compared to Group I Butorphanol (P < 0.001). Salins SR *et al*[11] conducted study on extension of brachial plexus block with 1.5% Lignocaine Adrenaline and Buprenorphine a comparison with 1.5% Lignocaine and Adrenaline. Although the addition of Buprenorphine had no significant effect on the quality of analgesia but the duration of analgesia was significantly prolonged more than three times than other group. Our study is comparable with the study of Viel and colleagues.[16] They have studied comparison of Buprenorphine and Morphine in supraclavicular brachial plexus block and evaluated that Buprenorphine significantly produces prolonged postoperative pain relief. But in our study we compared butorphanol vs nalbuphine and found that nalbuphine produces more prolonged anesthesia compared to butorphanol.

Post-Operative Complications: In our study, 5 patients from Group-I and 2 patients from Group-II had vomiting but the difference was statistically insignificant (P>0.05). Our results are comparable to those of Viel EJ and Wajima Z *et al.*[10,16] They also reported vomiting in their patients and reported that Brachial plexus infusion of opioids had more potent analgesic effect than systemic

administration. So lower dose of opioids into neurovascular sheath rather than systemic administration should be chosen to prevent side effects such as nausea and vomiting.

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Source of Support: None Declared
Conflict of Interest: None Declared