Print ISSN: 2321-6379
Online ISSN: 2321-595X

Original Article

Buprenorphine with Local Anaesthetic Combination in Supraclavicular Brachial Plexus Block Produced Prolonged Post-operative Analgesia Compared to Butorphanol with Local Anaesthetic: A Prospective, Randomized, Comparative Study

Gadi Grace Priyanka[1], S K Farooq Basha[2]

[1]Assistant Professor, Department of Anaesthesiology, ACSR Government Medical College, Nellore, Andhra Pradesh, India, [2]Assistant Professor, Department of Anaesthesiology, ACSR government Medical College, Nellore, Andhra Pradesh, India

Abstract

Background: Supraclavicular approach for brachial plexus block offers an alternative anesthesia for upper extremity surgery. Addition of opioid agents in local anesthetic solutions for prolongation of analgesia through brachial plexus block has been very effective in controlling post-operative pain. The time to request for the 1st dose of rescue analgesia can be prolonged by adding buprenorphine or butorphanol in local anesthetic solutions.

Methodology: After institutional ethical committee approval, 60 American Society of Anesthesiologists I/II patients were randomized for this study. They belong to either gender, aged between 18 and 55 years of age. Patients who required brachial plexus block through supraclavicular approach were included and the study drugs were administered according to group allocation into Group I and Group II. Sensory and motor block characteristics were monitored and recorded in all patients, complications as well. Hemodynamic monitoring was done every 5 min interval in the intraoperative period and every 15 min intervals in the post-operative period. Patients were administered rescue analgesia postoperatively when visual analog scale (VAS) scores were ≥4. Data were analyzed statistically.

Results: Onset time to sensory block was 3.1 (1.1) min in Group I and 4.9 (1) min in Group II, and there was statistically significant difference between groups ($P < 0.0001$). Onset time to motor block was 5.4 (1.3) min in Group I and 9.3 (1.5) min in Group II, and the difference between groups was found to be significant statistically ($P < 0.0001$). The time to 1st request of analgesia was found to be statistically significantly between I and II groups (354.8 [55.6] vs. 448.3 [34.4] min, $P < 0.0001$), respectively.

Conclusion: Both buprenorphine and butorphanol produced effective analgesia in combination with local anesthetics without significant side effects, but buprenorphine produced prolonged analgesia when compared to butorphanol.

Key words: Bupivacaine, Buprenorphine, Butorphanol, Lignocaine, Supraclavicular brachial plexus block

INTRODUCTION

Post-operative pain management is a challenge to the attending physician as it is the most crucial period of stress to the surgical patient. Improper or inadequate analgesia leads to stress-related complications, especially hemodynamic and cardiac complications. Hence, it is the duty of the anesthesiologist to provide optimum post-operative analgesia to the surgical patient in the immediate period, especially the first 24 h after surgery. Brachial plexus block provides adequate anesthesia and post-operative analgesia for all the upper limb procedure. Supraclavicular brachial plexus block was first introduced in 1911 by Kulenkampff as a landmark-based approach.[1,2] With the advent of many adjuvants, preferably opioid agents are

Access this article online

www.ijss-sn.com

Month of Submission : 07-2019
Month of Peer Review : 08-2019
Month of Acceptance : 08-2019
Month of Publishing : 09-2019

Corresponding Author: Dr. S K Farooq Basha, Flat No: 403, Teaching Staff Quarters, ACSR Government Medical College Campus, Nellore - 524 004, Andhra Pradesh, India.

used for prolongation of post-operative analgesia through brachial plexus block due to their potency and reliability though not with complications.[3] Many randomized clinical trials proved that opioids such as fentanyl, tramadol, butorphanol, nalbuphine, and buprenorphine were used with varying efficacies along with local anesthetics in brachial plexus blockade to prolong post-operative analgesia.[4,5] Recently, there has been interest in the adjuvant buprenorphine as it is partial agonist with high potency and easily available. The aim of this study is to compare the efficacy of buprenorphine versus butorphanol when administered in combination with local anesthetics in supraclavicular approach of brachial plexus blockade.

METHODOLOGY

After institutional ethical committee approval and written, informed consent from patient attendants, patients of the American Society of Anesthesiologists (ASA) I/II posted for forearm and elbow procedures, of both genders and age group between 18 and 55 years were randomly allocated into two groups of 30 each.

Exclusion Criteria

The following criteria were excluded from the study:

- ASA III/IV
- Bleeding disorders
- Cardiovascular, respiratory, renal, and liver diseases
- Hemodynamic instability
- Patient with known hypersensitivity to local anesthetics
- Addiction to opioids.

Group I (butorphanol) was allocated to receive inj. 2% lignocaine hydrochloride – 10 ml, inj. 0.5% bupivacaine hydrochloride – 19 ml, and inj. butorphanol – 1 mg (1 ml), total volume made to 30 ml.

Group II (buprenorphine) was allocated to receive inj. 2% lignocaine hydrochloride – 10 ml, inj. 0.5% bupivacaine hydrochloride – 19 ml, and inj. butorphanol – 100 μg (1 ml), total volume made to 30 ml.

In the pre-operative room, baseline hemodynamic parameters such as heart rate, blood pressure, respiratory rate, and SpO_2 were recorded. Patients were not premedicated with any sedatives. Procedure of supraclavicular brachial plexus block was explained in detail before shifting the patient to the operating room. 18 G intravenous (IV) cannula was secured. Maintenance IV fluids were started with balanced salt solution. Pulse oximetry and cardiac monitors were attached. Patients were instituted supraclavicular brachial plexus block using nerve stimulator-guided technique and study drugs were given as per the group allocation. The study drugs were supplied to the operating room just before administering them by the principal investigator who was aware of group allocation. The anesthesiologist who performed brachial plexus block and the observer anesthesiologist who recorded the data were blinded to the group allocation to ensure blinding. After instituting supraclavicular block, patients were monitored for hemodynamic parameters such as heart rate and blood pressure every 5 min throughout the intraoperative period. Patients were also assessed for time of onset to sensory and motor block and duration of post-operative analgesia (time to 1st request analgesia). Postoperatively, visual analog scale (VAS) scores were assessed and patients were given rescue analgesia when VAS ≥4.

VAS was explained to the patients in native language. The patients were shown a 10 cm long scale marked 0–10 on a blank paper and told that the number 0 indicates no pain and number 10 indicates worst possible pain. Patients were observed in the post-anesthesia care unit for 2 h and then shifted to the ward for further monitoring. All the recorded data were compiled, tabulated, and analyzed statistically.

RESULTS

All the 60 patients completed the study. None of the patients had failed block. Patients of three groups were comparable with respect to demographic data such as age, weight, ASA grading, gender ratio, and duration of surgery, $P > 0.05$, statistically insignificant. This is represented in Table 1. Types of surgical procedures performed were mentioned in Table 2.

On analyzing the baseline and perioperative hemodynamic parameters, there was no significant difference in heart rate and systolic blood pressure preoperatively, at 0, 15, 30, 45, 60, 75, 90, and 120 min and postoperatively between groups as shown in Figures 1 and 2, respectively.

The time to onset of sensory block was 3.1 (1.1) min in Group I (butorphanol) and 4.9 (1) min in Group II

Table 1: Demographic data

Demographic variable	Group I (butorphanol) *n*=30	Group II (buprenorphine) *n*=30	*P*-value
Age in years	43.5±8.58	47.7±9.08	0.76
Weight in kg	55.87±8.90	59.65±6.98	0.87
American Society of Anesthesiologists grading, I/II	17:13	20:10	0.34
Male: female ratio	18:12	16:14	0.45
Duration of surgery	115±16	122±12	0.56

P>0.05 considered statistically insignificant. Data represented as mean/standard deviation. Fisher's exact test

(buprenorphine), and there was statistically significant difference between groups ($P < 0.0001$). The time of onset of motor block was 5.4 (1.3) min in Group I and 9.3 (1.5) min in Group II, and there was statistically significant difference between groups ($P < 0.0001$) which was represented in Table 3 and Figure 3. Butorphanol group had earlier onset of sensory and motor block when compared to buprenorphine group which is statistically significant.

The duration of post-operative analgesia was found to be statistically significantly varied between I and II groups (354.8 [55.6] vs. 448.3 [34.4] min, $P < 0.0001$), respectively as represented in Table 3 and Figure 4. Buprenorphine group produced significantly prolonged analgesia when compared to butorphanol group. Complications are observed in three patients in Group I and four patients in Group II had vomiting, and one patient in Group I had pruritis. There was no significant difference between Groups I and II in occurrence of adverse effects ($P = 1.0$) as represented in

Table 2: Types of surgeries

Surgical procedure	Group I (butorphanol) *n*=30	Group II (buprenorphine) *n*=30
Fracture both bones fore arm	16	14
Fracture lower third humerus	4	6
Fracture distal third radius	7	4
Fracture distal third ulna	3	6

Table 3: Sensory and motor block characteristics

Time in minutes	Group I (butorphanol) *n*=30	Group II (buprenorphine) *n*=30	*P*-value
Onset time to sensory block	3.1 (1.1)	4.9 (1.0)	0.001
Onset time to motor block	5.4 (1.3)	9.3 (1.5)	0.001
Time to 1st request analgesia	354.8 (55.6)	448.3 (34.4)	0.001

P<0.05 considered statistically significant. Data represented as mean/standard deviation. Student's *t*-test

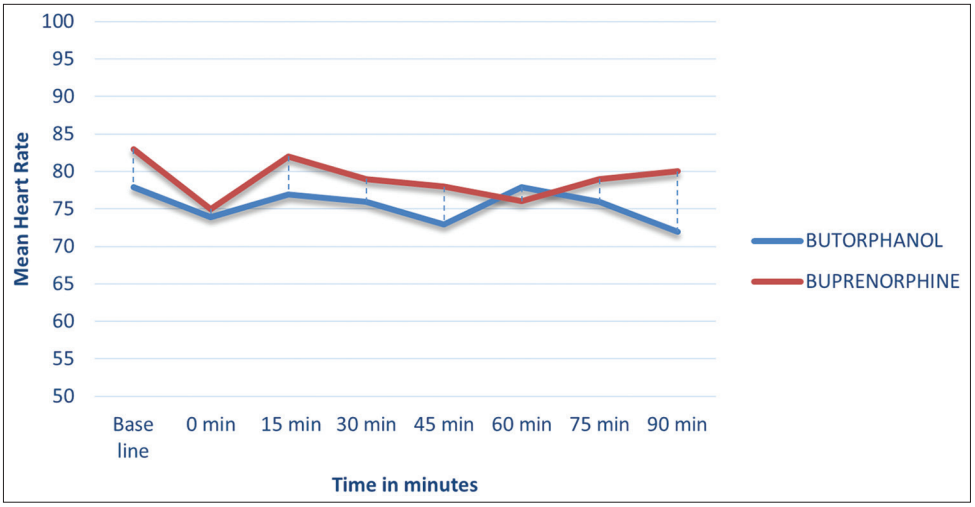

Figure 1: Mean heart rate

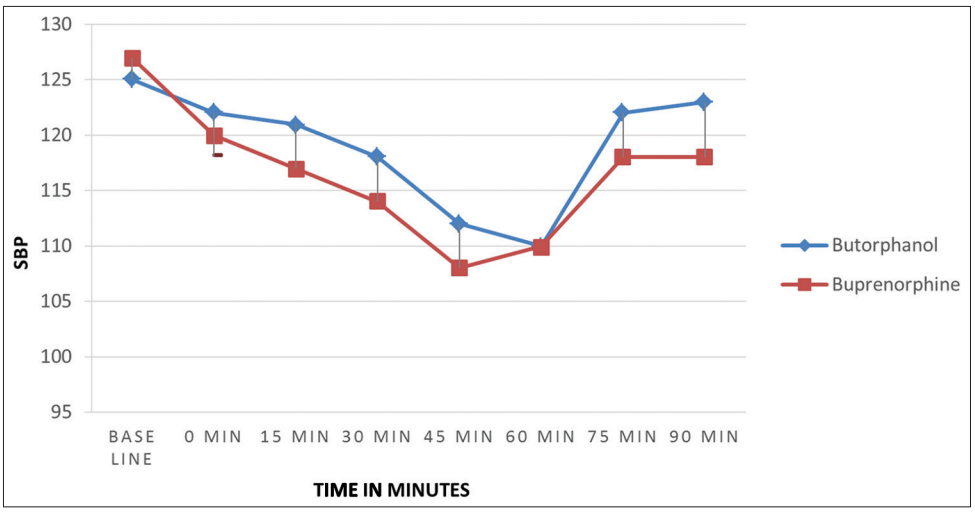

Figure 2: Mean systolic blood pressure

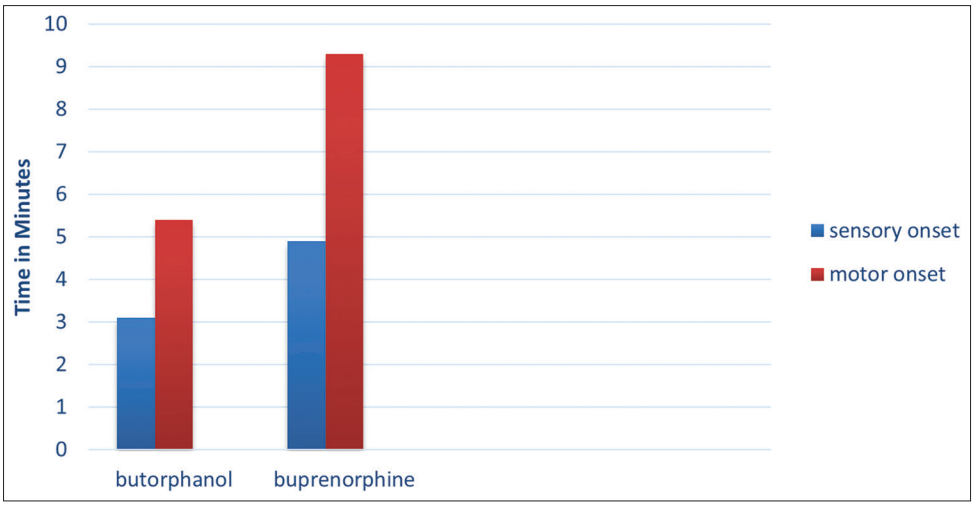

Figure 3: Onset time of sensory and motor block

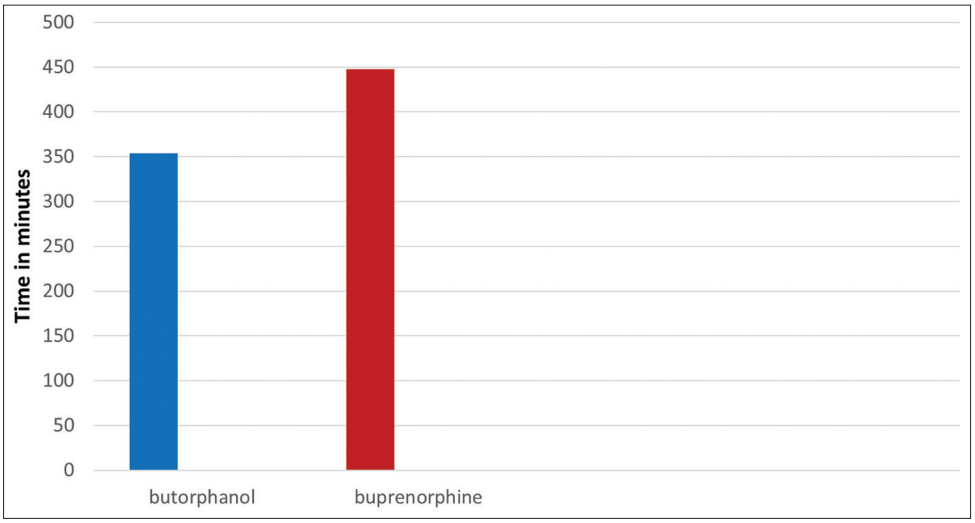

Figure 4: Duration of post-operative analgesia

Table 4: Side effects

Parameter	Group I (butorphanol) *n*=30 (%)	Group II (buprenorphine) *n*=30 (%)	*P*-value
Vomiting	3 (10)	4 (13.3)	1.0
Pruritus	2 (6.6)	0	1.0
Pneumothorax	0	0	-
Nerve palsy	0	0	-

P>0.05 considered statistically insignificant. Data represented as absolute numbers and percentage. Chi-square test

Table 4. None of the patients in both groups developed complications related to supraclavicular brachial plexus block technique such as pneumothorax or nerve palsy.

DISCUSSION

Supraclavicular brachial plexus block is commonly performed upper limb brachial plexus block for orthopedic procedures. It provides effective and profound sensory and motor blockade and is also easy to perform. With the aid of nerve stimulator guided technique, supraclavicular blocks are being performed with high success rate.[6] Single-shot supraclavicular techniques may not provide post-operative analgesia for prolonged periods. With the availability of various adjuvants, it has been traditional method to combine adjuvants to local anesthetics to prolong the post-operative analgesia as well as enhance the quality of blockade.[7,8] Butorphanol is a partial agonist-antagonist and potent opioid, documented in various studies to prolong analgesia when administered with brachial plexus blocks.[9]

In this randomized, double-blinded trial, we compared butorphanol and buprenorphine as an adjuvant to local anesthesia mixture in supraclavicular brachial plexus block and found that buprenorphine group had delayed onset of sensory, motor blockade, and longer duration of post-operative analgesia than butorphanol group.

Wajima *et al.* have studied butorphanol in local anesthetic through continuous brachial plexus block and have demonstrated that butorphanol produces prolonged pain relief in post-operative period.[10]

Viel and Eledjan have shown that buprenorphine 3 μg/kg in supraclavicular brachial plexus block produces significantly longer pain relief than morphine after upper limb surgery.[11] So here, in this study, we have used butorphanol 100 mg versus buprenorphine 100 μg in addition to local anesthetic drugs through supraclavicular brachial plexus block. In our study, postoperatively, comparison of the duration of postoperatively analgesia was done by VAS score and showed statistically significant prolonged duration of analgesia in Group-II buprenorphine compared to Group I butorphanol ($P < 0.0001$).

Salins *et al.* conducted the study on extension of brachial plexus block with 1.5% lignocaine adrenaline and buprenorphine a comparison with 1.5% lignocaine and adrenaline.[12] Although the addition of buprenorphine had no significant effect on the quality of analgesia, the duration of analgesia was significantly prolonged more than 3 times than other groups.

Our study is comparable with the study of Viel and Eledjan. They have studied comparison of buprenorphine and morphine in supraclavicular brachial plexus block and evaluated that buprenorphine significantly produces prolonged post-operative pain relief.

Our study is also comparable with the study of Trivedi and Shah. They have studied comparison of buprenorphine 100 μg and butorphanol 1 mg in supraclavicular brachial plexus block and evaluated that buprenorphine significantly produces prolonged post-operative pain relief.[13]

CONCLUSION

We concluded that both opioids are potent and safe postoperative analgesics in brachial plexus block without significant side effects and hemodynamic changes. Buprenorphine is more potent and produces longer duration of postoperative analgesia compared to butorphanol.

REFERENCES

1. Cousins MJ, Bridenbaugh PO. Neural Blockade in Clinical Anaesthesia and Management of Pain. 2nd ed. Philadelphia, PA: Lippincott; 1998.
2. Lanz E, Theiss D, Jankovic D. The extent of blockade following various techniques of brachial plexus block. Anaesth Analg 1983;62:55-8.
3. Murhy DB, McCartney CJ, Chan VW. Novel analgesic adjuvants for brachial plexus block: A systemic review. Anaesth Analg 2000;90:1122-8.
4. Paliwal B, Karnawat R. Comparative study of effect of buprenorphine or clonidine as adjuvants to local anaesthetics (bupivacaine 0.25%) for supraclavicular brachial plexus block. IOSR J Dent Med Sci 2013;4:30-9.
5. Candido KD, Winnie AP, Ghaleb AH, Fattouh MW, Franco CD. Buprenorphine added to the local anaesthetic for axillary brachial plexus block prolongs post-operative analgesia. Reg Anaesth Pain med 2002;27:162-7.
6. Taylor MS. Managing post-operative pain. Hosp Med 2001;62:560-3.
7. Vitenbek IA, Zhakupov RK, Girshan AI. The perineural administration of opiates during regional conduction block of nerve trunks and plexuses. Anesteziol Reanimatol 1991;4:56-9.
8. Christoph S, Doz P. Peripheral mechanisms of opioid analgesia. Anesth Analg 1993;76:182-91.
9. Wajima Z, Shitara T, Nakajima Y, Kim C, Kobayashi N, Kadotani H, *et al*. Comparison of continuous brachial plexus infusion of butorphanol, mepivacaine and mepivacaine butorphanol mixtures for post operative analgesia. Br J Anaesth 1995;75:548-51.
10. Wajima Z, Shitara T, Nakajima Y, Kim C, Kobayashi N, Kadotani H, *et al*. Continuous brachial plexus infusion of butorphanol mepivacaine mixtures for analgesia after upper extremity surgery. Br J Anaesth 1997;78:83-5.
11. Viel EJ, Eledjan JJ. Brachial plexus block with opioids for postoperative pain relief: Comparison between buprenorphine and morphine. Reg Anesth 1989;14:274-8.
12. Salins SR, Abraham V, Kaur B, Abraham J. Extension of brachial plexus block with 1.5% lignocaine adrenaline and buprenorphine a comparison with 1.5% lignocaine adrenaline. J Anaesthesiol Clin Pharmacol 2002;16:47-52.
13. Trivedi V, Shah J. A clinical comparative study of Inj butorphanol vs buprenorphine in brachial plexus block via supraclavicular approach for post-operative analgesia. Ind J Pain 2007;21:28-34.

How to cite this article: Priyanka GG, Basha SKF. Buprenorphine with Local Anaesthetic Combination in Supraclavicular Brachial Plexus Block Produced Prolonged Post-operative Analgesia Compared to Butorphanol with Local anaesthetic: A Prospective, Randomized, Comparative Study. Int J Sci Stud 2019;7(6):45-49.

Source of Support: Nil, **Conflict of Interest:** None declared.