

COMPARISON OF BUTORPHANOL AND BUPRENORPHINE AS AN ADJUVANT TO LOCAL ANAESTHESIA IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK FOR POST-OPERATIVE ANALGESIAC. N. Vinod¹, D. G. Talikoti²**HOW TO CITE THIS ARTICLE:**

C. N. Vinod, D. G. Talikoti. "Comparison of Butorphanol and Buprenorphine as an Adjuvant to Local Anesthesia in Supraclavicular Brachial Plexus Block for Post-Operative Analgesia". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 16, April 21; Page: 4287-4293, DOI: 10.14260/jemds/2014/2433

ABSTRACT: BACKGROUND: Supraclavicular brachial plexus block provides anesthesia for surgeries around elbow, forearm and hand. With advent of opioid receptors, variety of opioid agents is used for postoperative analgesia via brachial plexus block. Butorphanol and Buprenorphine can be used along with local anesthetics to provide post op analgesia. **AIMS:** 1) To study the onset and extent of sensory and motor blockade. 2) To compare the duration of postoperative analgesia in two groups. **METHODOLOGY:** A study was carried out in 30 patients aged 18-60yr of ASA grade I & II of either sex in each group undergoing orthopedic upper limb surgeries via supraclavicular brachial plexus block. Injection Butorphanol 1mg (Group-I) and Buprenorphine 150µg (Group-II) were added to local anesthetic mixture. Onset of sensory and motor blockade, extent of blockade and occurrence of any complications were studied in both the groups. All patients were observed for analgesia hourly until patient demanded analgesia post-operatively by VAS pain score. **RESULTS:** In Group II (Buprenorphine) onset of sensory, motor blockade and complete blockade was delayed as compared to Group I (Butorphanol). In Group I patients, VAS score was 39.44 ± 16.66 at the end of 5 hours while in Group II patients 50.35 ± 25.65 VAS score at the end of 8 hours. So the duration of analgesia was upto 5-6 hours in Group I, where it was upto 8-9 hours in Group II. **CONCLUSION:** Both drugs are potent analgesic in brachial plexus block, but Buprenorphine is more potent and produces longer duration of postoperative analgesia than Butorphanol.

KEYWORDS: Butorphanol, Buprenorphine, Supraclavicular Brachial Plexus Block, Postoperative Analgesia.

INTRODUCTION: Acute postoperative pain is a complex physiological reaction to tissue injury or disease. Its manifestation of autonomic, psychological and behavioral responses results in unpleasant, unwanted sensory and emotional experience. Despite advances in knowledge of pathophysiology of pain, pharmacology of analgesics and development of effective techniques for post-operative pain control, many patients continue to experience considerable discomfort.¹

Brachial Plexus block provides adequate anesthesia and post-operative analgesia for all the upper limb procedure. Supraclavicular brachial plexus block provides anesthesia for surgeries around elbow, forearm and hand.^{2,3} With this technique, land marks are easy to locate and tourniquet pain is better tolerated.

With advent of opioid receptors, variety of opioid agents are used for post-operative analgesia via brachial plexus block.⁴ Butorphanol, a synthetic opioid is seven times more potent than morphine.⁵ Buprenorphine, a semisynthetic thebaine derivative is more potent than morphine, pethidine, pentozocine and the duration of analgesia is longer than all. Buprenorphine added to the

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local anesthetic solution for brachial plexus block prolongs post-operative analgesia as do the butorphanol, tramadol, clonidine etc.^{6,7}

The present study is conducted to assess the onset of blockade, safety and efficacy of post-operative analgesia between butorphanol and buprenorphine administered through Supraclavicular brachial plexus block.

METHODS: After ethical committee approval and written informed consent, double blind randomized prospective clinical study was carried out on 60 ASA grade 1 & 2 patient aged 18-60 years, posted for upper limb orthopedic surgeries. All the patients were randomly allocated into two groups so that each group consists of 30 patients each.

GROUP – I:

Inj. Bupivacaine hydrochloride (0.5%)	20 ml
Inj. Lignocaine hydrochloride (2%)	10 ml
Inj. Butorphanol	1 mg

GROUP – II:

Inj. Bupivacaine hydrochloride (0.5%)	20 ml
Inj. Lignocaine hydrochloride (2%)	10 ml
Inj. Buprenorphine	150 µg (0.15 mg)

Patients not willing to be a part of the study, having known allergy or addiction to study drugs, bleeding disorder, uncontrolled diabetes mellitus, pregnant woman, or pre-existing peripheral neuropathy were excluded from the study.

In operating theater 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 spo₂ were recorded. An 18G i.v. cannula secured. Supraclavicular block was given utilizing the paresthesia technique. The drug to be used for the block was supplied by a concerned person and injected by the researcher totally blinded to the medication being used. Sensory and Motor blockade was evaluated at 5, 10, 15, 20 and 25 minutes after giving drug.

Sensory block was assessed by pin prick method:

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

Motor blockade was assessed by following scale:

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 spo₂ 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,

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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 until patient demanded analgesia. Duration of analgesia was noted as time taken until patient demanded analgesia. 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 Excruciation 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 \pm 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 ($p > 0.05$).

	Group I (n=30)	Group II (n=30)	't'	P	Inference
Sensory Block	3.46 \pm 1.00	5.23 \pm 1.54	3.55	<0.001	HS
Motor Block	6.36 \pm 1.75	9.2 \pm 1.32	7.1	<0.001	HS
Complete Blockade	14.6 \pm 3.28	17.73 \pm 4.05	3.13	<0.001	HS

Table 1: Block characteristics

Table 1 shows that Statistically, there was delayed onset of sensory, motor and complete blockade in Group II compared to Group I ($P < 0.001$).

HS = Highly significant

VAS score	Group-I (n=30)	Group-II (n=30)	t value	P value	Inference
4 hrs.	25	0			
5 hrs.	39.44 \pm 16.66	25 \pm 0	2.30	0.03	HS
6 hrs.	56.66 \pm 20.37	30.71 \pm 9.75	2.10	0.0016	HS
7 hrs.	27.14 \pm 8.09	41.66 \pm 18.25	2.11	0.0299	HS
8 hrs.	-	50.35 \pm 25.65			HS

Table 2: Duration of analgesia (VAS Score)

HS=Highly Significant

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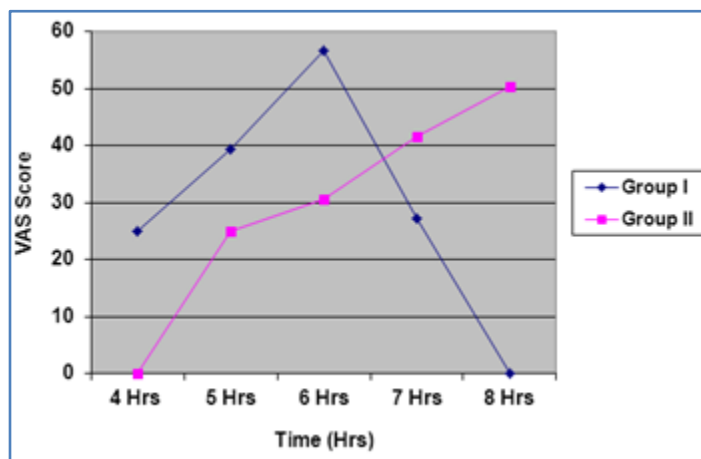


Figure 1: Duration of Analgesia (VAS Score)

At the end of 6 hrs, Group I had VAS score of 56.66 ± 20.37 , indicates moderate pain and analgesia required and in Group II had VAS score of 30.71 ± 9.75 , it did not required analgesia. The difference statistically significant. While at the end of 8 hrs, Group II had VAS score of 50.35 ± 25.65 , thus they required rescue analgesia. Thus, Group I patients require rescue analgesia at the end of 5 hrs. while Group II patient require at the end of 8 hrs. Thus difference was statistically significant ($P < 0.05$). So Group II Buprenorphine patients had long duration of pain relief in post-operative period.

COMPLICATIONS: Only 3 patients in Group-I & 4 patients in Group-II had vomiting and difference was insignificant. Pruritus seen in one patient in Group-I. No other side effects were observed in any groups.

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

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 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.

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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 Z et al^{11,12} have studied Inj. Butorphanol in local anesthetic via continuous brachial plexus block and have demonstrated that Butorphanol produces prolonged pain relief in postoperative period. Viel and colleagues,¹³ have shown that Inj of Buprenorphine 3 µg/kg in supraclavicular brachial plexus block produces significantly longer pain relief than morphine after upper limb surgery. So here, in our study we have used Inj. Butorphanol 100mg v/s Inj. Buprenorphine 150µg 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 Buprenorphine compared to Group I Butorphanol ($P < 0.001$).

Salins SR, Abraham V, Kaur B, Abraham-I¹⁴ 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.¹³ They have studied comparison of Buprenorphine and Morphine in supraclavicular brachial plexus block and evaluated that Buprenorphine significantly produces prolonged postoperative pain relief.

Our study is also comparable with the study of Trivedi V, Shah J.¹⁵ They have studied comparison of buprenorphine 100µg and butorphanol 1mg in supraclavicular brachial plexus block and evaluated that Buprenorphine significantly produces prolonged postoperative pain relief.

Post-Operative Complications: In our study, 3 patients from Group-I and 4 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. 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.

CONCLUSION

- In Group II (Buprenorphine), onset of sensory, motor blockade and complete blockade was delayed as compared to Group I (Butorphanol).
- Duration of postoperative analgesia was longer (upto 8-9 hrs. postoperatively) in Group II, compared to Group I had postoperative analgesia duration of 5-6 hrs.

So we concluded that both opioids are potent postoperative analgesics in brachial plexus block, but Buprenorphine is more potent and produces longer duration of postoperative analgesia than Butorphanol.

BIBLIOGRAPHY:

1. Donovan BD. Patient attitudes to postoperative pain relief. *Anaesth Intens Care* 1983; 11: 125-28.
2. Cousins MJ, Bridenbaugh PO. *Neural blockade in clinical anaesthesia and management of pain*. 2nd ed. Philadelphia: Lippincott; 1998.
3. Lanz E, Theiss D, Jankovic D. The extent of blockade following various techniques of brachial plexus block. *Anaesth Analg* 1983; 62: 55-58.
4. Damien B, Murhy, Colin JL, Cartney, Vincent WS. Novel analgesic adjuvants for brachial plexus block: A systemic review. *Anaesth Analg*.2000; 90: 5, 1122-8.
5. Mir IH, Hamid A. Addition of butorphanol to Lidocaine prolongs duration of the axillary brachial plexus block. *Internet Journal of Anaesthesiology* 2008; 16:1.
6. 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 Journal of Dental and Medical Sciences* 2013; 4 (3):30-39.
7. 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: 162-167.
8. Taylor MS. Managing post-operative pain. *Hosp Med* 2001; 62: 560-563.
9. Vitenbek IA, Zhakupov RK, Girshan AI. The perineural administration of opiates during regional conduction block of nerve trunks and plexuses. *Anesteziol Reanimatol*.1991 Jul-Aug; (4):56-9.
10. Stein Christoph, Priv Doz. Peripheral mechanisms of Opioid Analgesia. *Anesth Analg* 1993;76:182-191.
11. 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: 548-551.
12. 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: 83-85.
13. Viel EJ, Eledjan JJ. Brachial plexus block with opioids for postoperative pain relief: Comparison between buprenorphine and morphine. *Reg Anesth* 1989; 14: 274 - 278.
14. 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. *Journal of Anaesthesiology Clinical pharmacology* 2002; 16:47-52.
15. Trivedi V, Shah J. A clinical comparative study of Inj butorphanol v/s buprenorphine in brachial plexus block via supraclavicular approach for post-operative analgesia. *Ind J pain* 2007; 21: 28-34.

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Date of Submission: 25/03/2014.

Date of Peer Review: 26/03/2014.

Date of Acceptance: 03/04/2014.

Date of Publishing: 18/04/2014.