

## A Comparative Study of Butorphanol Versus Buprenorphine In Supraclavicular Brachial Plexus Block For Post Operative Analgesia

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### Abstract:

**Background:** Supraclavicular brachial plexus block offers an alternative anaesthesia for upper extremity surgery. Addition of opioid agents in local anaesthetic solutions for postoperative analgesia via brachial plexus block has been very effective in controlling post-operative pain. The duration of post-operative analgesia can be prolonged by adding Buprenorphine and Butorphanol in local anaesthetic solutions.

**Methodology:** A double blinded randomized parallel group study was carried out in 30 patients aged 18-60yr of ASA grade I & II of either sex in each group undergoing upper limb surgeries via Supraclavicular Brachial Plexus Block at S V Medical College, Tirupati. Injection Butorphanol 1mg (Group-I) and Buprenorphine 100µg (Group-II) were added to local anaesthetic solutions. All patients were observed for onset of sensory, motor blockade and complications. Pulse rate and Blood Pressure were monitored intraoperatively at every 15 min intervals and postoperatively. All patients were observed for analgesia hourly until patient demanded analgesia post-operatively i.e. VAS >4.

**Results:** The time of onset of 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 ( $p < 0.0001$ ). 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 ( $p < 0.0001$ ). The duration of postoperative analgesia was found to be statistically significantly varied between I and II group (354.8(55.6) vs. 448.3(34.4) min,  $p < 0.0001$ ) respectively.

**Conclusion:** 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.

**Index Terms-** Lignocaine, Bupivacaine, Buprenorphine, Butorphanol, Supraclavicular Brachial Plexus Block.

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### I. 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, still post-operative pain management requires considerable development. Brachial plexus block provides adequate anesthesia and post-operative analgesia for all the upper limb procedure. Supraclavicular brachial plexus block (SBPB) provides anesthesia for surgeries around elbow, forearm and hand.**1, 2** With advent of opioid receptors, variety of opioid agents are used for post-operative analgesia via brachial plexus block.**3** . To date, the results of studies evaluating the efficacy of opioids and local anaesthetic combinations in the brachial plexus are inconclusive. However, some studies have shown that buprenorphine added to the local anaesthetic solution for axillary or supraclavicular brachial plexus block prolongs postoperative analgesia as do the butorphanol, tramadol, clonidine etc.**4, 5**

Hence, we conducted the study to assess the safety and efficacy of Opioids such as Butorphanol and Buprenorphine in relieving post-operative pain when administered through supraclavicular brachial plexus block in our study participants.

## II. Research Elaboration

After obtained written and informed consent, double blind randomized prospective clinical study was carried out on sixty ASA grade I and II patient aged 18-60 years, posted for upper limb orthopedic surgeries. The present study was carried out in Department of Anesthesiology, S.V Medical College, Tirupati.

### NATURE OF STUDY:

Randomized, double blinded, two arm, parallel group, comparative, prospective study.

### INCLUSION CRITERIA:

1. Age group of 18-60 years.
2. ASA grade I and grade II

### EXCLUSION CRITERIA:

1. ASA Grade-III and IV
2. Bleeding disorders
3. Cardiovascular disorders, respiratory disorders, renal disease and liver diseases.
4. Circulatory instability
5. Patient with known hypersensitivity to local anesthetics
6. Opioid Dependence

All the patients were randomly allocated into two groups so that each group consists of 30 patients each.

### GROUP – I:

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

### GROUP – II:

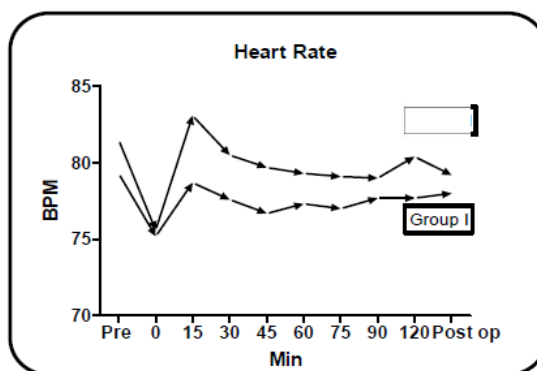
Inj. 2 % Lignocaine hydrochloride -----10 ml  
Inj. 0.5 % Bupivacaine hydrochloride ---20 ml  
Inj. Buprenorphine -- 100 mcg

In the assessment room, vital parameters like pulse rate, blood pressure, respiratory rate and baseline investigations like Hemoglobin, blood sugar, urea and creatinine, chest x-ray and ECG were checked. Thorough examination of all the systems and airway assessment was done.

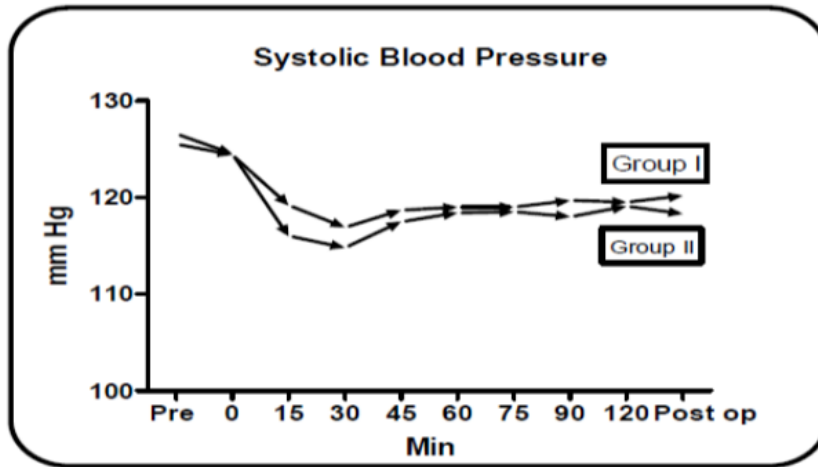
Visual Analog Scale (VAS) was explained to the patient. The patients were shown a 10 cm long scale marked 0-10 on a blank paper and told that '0' represented 'no pain' and 10 represented worst possible pain. Patients were advised nil per oral 6 hours before the procedure.

## III. Results

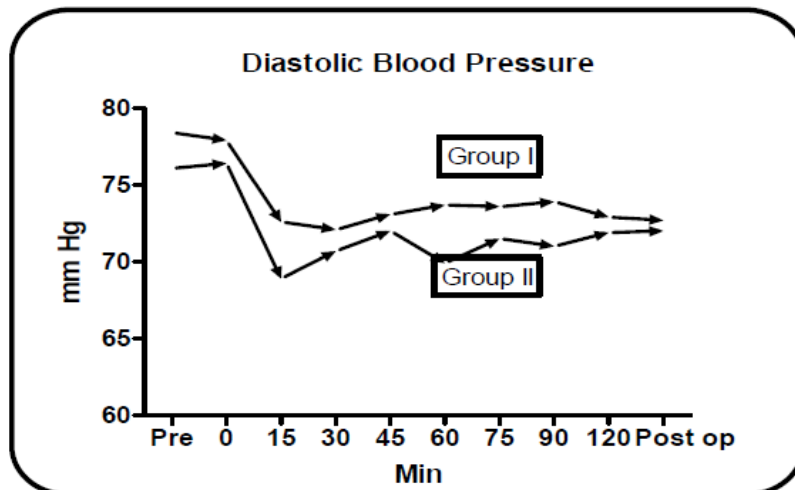
On evaluation of the baseline hemodynamic parameters, there was no significant difference in Heart rate ,systolic blood pressure ,diastolic blood pressure pre operatively, at 0, 15, 30, 45,60, 75, 90, 120 min and post operatively between groups as shown in table figure.



GRAPH -1: Variation in Heart Rate between group I and group II



**GRAPH-2:** Intraoperative variation in systolic blood pressure between group I & group II.



**GRAPHE-3:** Intraoperative variation in diastolic blood pressure between Gp I & Gp II

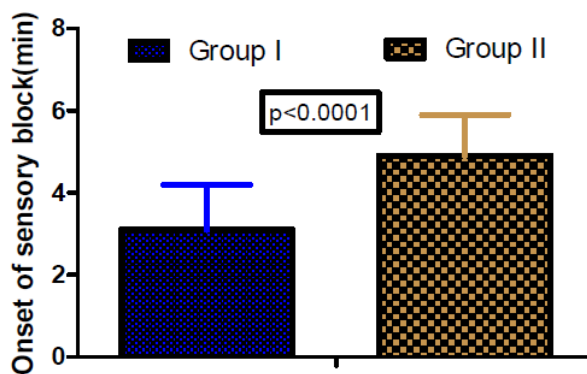
The time of onset of sensory block was 3.1(1.1) min in group I and 4.9(1) min in group II and there was statistically significant difference between groups ( $p < 0.0001$ ).

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 ( $p < 0.0001$ ).

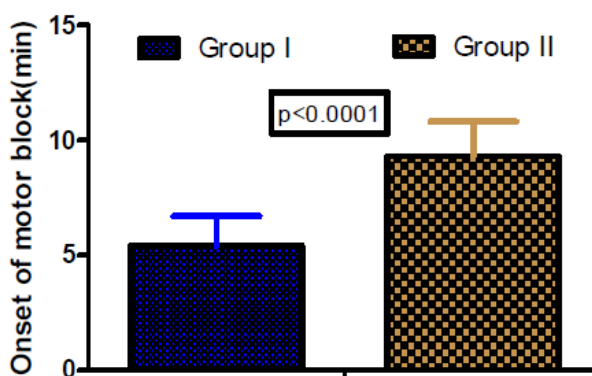
The duration of postoperative analgesia was found to be statistically significantly varied between I and II group (354.8(55.6) vs. 448.3(34.4) min,  $p < 0.0001$ ) respectively.

**Table 5: Duration of sensory block, motor block & post-operative analgesia between group I and group II**

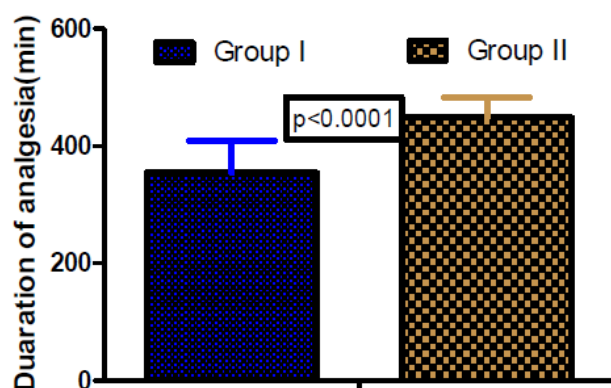
Parameters	Gp I (n = 30 )	Gp II (n =30 )	P value
Onset of sensory block (min)	3.1(1.1)	4.9(1.0)	<0.0001
Onset of motor block (min)	5.4(1.3)	9.3(1.5)	<0.0001
Duration of post-operative analgesia (VAS >4)(min)	354.8(55.6)	448.3(34.4)	<0.0001



**GRAPH 4: Comparison of time of onset of sensory block between groups.**



**GRAPH 5: Comparison of time of onset of motor block between groups.**



**GRAPH 6: Comparison of duration of analgesia between groups.**

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. ( $p=1.0$ ) None of the patients in both groups developed complications of supraclavicular brachial plexus block such as pneumothorax or nerve palsy.

Parameters	Group I (n=30)	Group II (n=30)	P value
Vomiting	3(10%)	4(13.3%)	1.0
Pruritis	1(3.3%)	0	1.0
Urinary retention	0	0	-
Pneumothorax	0	0	-
Nerve palsy	0	0	-

#### IV. 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.<sup>6</sup>

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.<sup>7, 8</sup>

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 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 **9, 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.

Viel and colleagues,**11** 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 100µg 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 < 0.0001).

Salins SR, Abraham V, Kaur B, Abraham, **12** 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.**11** 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.**13** 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.

## V. Conclusion

In Group II (Buprenorphine), onset of sensory and motor was delayed as compared to Group I (Butorphanol).

Duration of postoperative analgesia was longer in Group II, compared to Group I.

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

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