



## “BRACHIAL PLEXUS BLOCK WITH BUPIVACAINE: EFFECTS OF ADDED ALPHA ADRENERGIC AGONIST CLONIDINE & COMPARISON WITH EPINEPHRINE. A RANDOMISED CONTROL STUDY”.

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### ABSTRACT

Supraclavicular brachial plexus block is one of the most commonly employed regional anesthesia technique & is often described as “Spinal anesthesia of Upper limb”. Bupivacaine is one of the commonly used local anesthetic used for plexus anesthesia as it has long duration of action, however many additives have been tried in various studies in the search to decrease the latency of its onset of neural blockade as well as to increase its duration of analgesia, thereby improving the efficacy of peripheral neural blocks. We therefore studied the effect of clonidine 150 micrograms when added as an adjunct to bupivacaine for supraclavicular brachial plexus block in comparison with Bupivacaine combined with Epinephrine and Bupivacaine alone, in a rural tertiary care medical institute. We found that addition of clonidine provides rapid onset of anesthesia along with prolonged sensory, motor blockade and prolonged duration of analgesia without any significant side effects as compared to 2.025% bupivacaine with epinephrine or 0.25% Bupivacaine alone.

**KEYWORDS :** Supraclavicular block, bupivacaine, Clonidine, epinephrine, efficacy, analgesia

### Introduction:

Regional anesthesia as the name suggest implies that the anesthetic is limited to the part of a body involved in surgical procedure. Skilful application of peripheral neural blockade broadens the anaesthesiologist's armamentarium. It is useful as a standalone anesthesia mode thereby avoiding the complications of general anesthesia like airway problems, improved cognitive function & postoperative recovery. Also, in case scenarios where presence of significant systemic comorbidities increases the risks of perioperative morbidity and mortality under general anaesthesia, regional anaesthesia provides much needed option.

Given intraoperatively, it can complement general anaesthesia by providing postoperative analgesia, decreasing the requirements of general anaesthetic drugs as well as lesser consumption of post-operative systemic analgesics, increasing the quality of patient care. D Kulenkampff first performed the classic supraclavicular block in 1912 and the subclavian perivascular approach was first described by Winnie AP and Collins VJ in 1964 1.

Supraclavicular brachial plexus block is one of the most commonly employed regional anesthesia technique because of its anatomic characteristic of compactness of majority of plexus present in a small surface area & is often described as “Spinal anesthesia of Upper limb”. Bupivacaine is one of the commonly used local anesthetic used for plexus anesthesia as it has long duration of action 2. However many additives like epinephrine, opioids, dexamethasone, tramadol, neostigmine, magnesium sulphate and alpha 2 agonist like clonidine and dexmedetomidine have been tried in the search to decrease the latency of onset of neural blockade as well as to increase its duration of action thereby improving the efficacy of peripheral neural blocks 3,4,5.

Clonidine is one of the least expensive drugs available for use as adjunct to peripheral nerve blockade. We therefore studied the effect of clonidine when added as an adjunct to bupivacaine for supraclavicular brachial plexus block.

### Materials and methods:

The present prospective randomised double blinded study was carried out at our institution over a period of one and half years. Institutional ethical committee's approval was obtained. Informed written consent in patient's language was obtained after detailed explanation to patient about the study. 90 adult patients were enrolled for the study.

### Inclusion criteria:

1. Patient of either sex or age between 18–60 years.
2. ASA grade I/II
3. Posted for various upper limb surgeries as elective or emergency cases.

### Exclusion criteria:

1. ASA grade III and above
2. Age less than 18 or more than 60
3. Pregnant females
4. Patient with coagulation and bleeding disorders.
5. Patients with known neurological deficit/seizure disorder as well as hemodynamic instability.
6. Contraindications to perform supraclavicular brachial plexus block like sepsis at local site, pneumothorax, and bilateral upper limb procedures.

These 90 patients were randomly divided into 3 groups of 30 patients each by asking the patients to choose one of the prewritten closed envelopes. The supraclavicular block was performed by experienced anaesthesiologist and the observations were made by and independent anaesthesiologist who was unaware about the drug being given.

### Groups:

- Group B: (control group) -- Inj. Bupivacaine 0.25 % 39 ml + 1 ml Normal Saline  
 Group BC: (Clonidine group) – Inj. Bupivacaine 0.25 % 39 ml + 1 ml 150 Microgram clonidine.  
 Group BE: (Epinephrine group) – Inj. Bupivacaine 0.25 % 39 ml + 1ml containing 0.2mg Epinephrine.

### Technique:

Standard PAC, preoperative NBM orders were followed. IV access and standard monitors (ECG, NIBP, and SpO<sub>2</sub>) were secured after patients after wheeled into operation theatre. Equipment for peripheral nerve blocked i.e. peripheral nerve stimulator, Drug syringes were kept ready.

Supraclavicular block was performed under aseptic technique with the help of knowledge of regional surface anatomy and peripheral nerve stimulator (standard approach across all the 3 groups) by senior anaesthetist with regular cautions to avoid intravascular injection of local anesthetic.

The following criteria were assessed and recorded during the procedure. Duration of sensory and motor blockade was assessed every second minute for the first 30 minutes and thereafter every 30 minutes till it lasted.

1. Onset of sensory blockade on 3 point scale
    - 0- No block
    - 1 – Sensory blockade with persistent of touch
    - 2 – Complete sensory blockade
  2. Onset of motor blockade on 3 point scale
    - 0 No block
    - 1 Motor blockade in at least three nerve territories of the upper limb
    - 2 Complete motor blockade
  3. Duration of surgery
  4. Duration of motor block
  5. Duration of analgesia (time required for first rescue analgesic as demanded by the patient & by Visual Analog score)
  6. Hemodynamic and respiratory parameters
  7. Sedation score
  8. Complications if any
- Statistical analysis was done by using software STATA 10.

**Results:**

The study comprised of 90 patients as per inclusion and exclusion criteria randomly divided into 3 groups as mentioned above. Demographic parameters like age, sex Weight were statistically comparable in all the three groups.

**Table 1: The mean duration of surgery in the three groups**

| Groups                              | B    | BC   | BE   |
|-------------------------------------|------|------|------|
| Mean duration of surgery in minutes | 92.5 | 95.1 | 98.3 |

The mean duration of surgery in the three groups was comparable

**Table 2: Mean onset of sensory blockade in the three groups**

| Groups                                 | B    | BC   | BE   |
|--|------|------|------|
| Mean onset of sensory block in minutes | 17.7 | 14.7 | 17.6 |

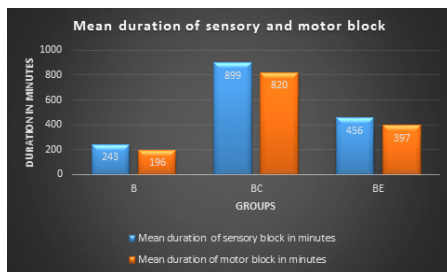
The onset of sensory block was faster in clonidine group as compared to the bupivacaine and epinephrine group.

**Table 3: Mean onset of motor blockade in the three groups**

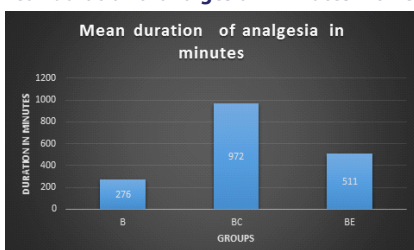
| Groups                               | B    | BC   | BE   |
|--------------------------------------|------|------|------|
| Mean onset of motor block in minutes | 22.3 | 17.5 | 21.9 |

The onset of motor block was faster in clonidine group as compared to the bupivacaine and epinephrine group.

**Graph 1: Mean duration of sensory and motor block in three groups**



**Graph 2: Mean duration of analgesia in minutes in three groups**



All the patients in three groups remained hemodynamically stable throughout the surgery and this was statistically comparable. There was no significant complication in any of the group and this was also statistically comparable.

**Discussion:**

The physiologic rationale for adding adjuvants to local anaesthetics is well established. Epinephrine has been traditionally chosen to be added to local anaesthetics in a concentration of 1:200000 to shorten the onset of action as well as to prolong the duration of local anaesthetics<sup>1</sup>.

The discovery of alpha<sup>2</sup> adrenoreceptors on primary afferent terminal (at both peripheral and spinal endings), on neuron in the superficial laminae of the spinal cord and within several brain nuclei supports the possibility of analgesic action of alpha agonist at peripheral, spinal and brainstem site<sup>3</sup>.

Demographic data, surgical types and surgical duration data (table 1) was comparable in all the groups.

Clonidine has been used in various dosages ranging from 30 micrograms to 300 micrograms in a study by Bernard & Macaire for peripheral neural blockade with a dose dependent effect seen regarding onset and mean duration of action<sup>6</sup>. In one of the systematic reviews about novel adjuvants added to brachial plexus blockade, the authors it was concluded that clonidine up to a dose of 150 micrograms appeared safe and therefore we used the dose of 150 micrograms in our study<sup>3</sup>.

The mean duration of onset time of sensory and motor blockade (table 2 & 3) was shorter in clonidine group suggesting earlier onset of action (which was statistically significant). Study done by different researchers like JM Bernard and Macaire<sup>6</sup> Gabriella Lohom et al<sup>7</sup> and Chakraborty et al<sup>8, 6</sup> also found similar findings. In one of the studies by J Eledjam et al<sup>9</sup>, they found comparable onset of motor blockades in patients who received clonidine and epinephrine. The plausible explanation to this being that irrespective of addition of epinephrine to the local anesthetic drug, the initial concentration of local anesthetic remains the same (which determines the onset of action) whereas, Clonidine it appears has synergistic action as well as different mechanism of action than local anesthetic which results in early onset of neural blockade.

The mean total duration of sensory and motor blockade was significantly more in clonidine group as compared to other two groups. The mean total duration of sensory and motor blockade of epinephrine group was significantly more as compared to plain bupivacaine group but shorter than the clonidine group. Similar finding was observed in study done by various researchers.<sup>6,7,8,9</sup>

The duration of analgesia was highest in clonidine group patients followed by epinephrine group and least in bupivacaine group. This finding was again similar to study done by various resercahers.<sup>8,9</sup>

There was no difference in hemodynamic parameters in all the three groups. There were no major procedural as well as hemodynamic complications in any of the study groups

**Conclusion:**

From the present study, it can be concluded that supraclavicular plexus block as mode of regional anesthesia in upper limb surgeries can be used successfully if adequate technique and equipment are used. Clonidine, when added in a dose of 150 micrograms to 0.25 % bupivacaine for supraclavicular plexus block provides rapid onset of anesthesia along with prolonged sensory, motor blockade and prolonged duration of analgesia without any significant side effects as compared to 0.25% bupivacaine with epinephrine or 0.25% Bupivacaine alone. Further large scale similar studies may be done at multiple centres under different setup and conditions to provide a more robust evidence.

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