Research Article

Effect of addition of Dexamethasone to Local Anaesthetic agent in Supra clavicular Brachial plexus block on Onset of action & Onset of sensory blockade parameters

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Abstract: Background & Method: This study conducted on 60 patients undergoing upper limb surgery lasting more than 90 minute were included in the study with an aim to study the Effect of addition of Dexamethasone to Local Anaesthetic agent in Supra clavicular Brachial plexus block on Onset of action & Onset of sensory blockade parameters. The elective surgical interventions were internal fixation of bones with plates and screws, excision of bone cysts, reconstructive and other surgeries involving upper limb. Result: The average age was 33.37±9.7 yrs in group A and 35.07±10.98 yrs in group B. The average weights of the patients were 60.40±8.62 kgs in group A and 63.33±8.48 in-group B respectively. Both groups had predominantly male patients, accounting for nearly 2/3 of the total study population in each group. There was no significant difference in age, weight and sex distribution. The average time of onset was 20.13±3.5 min in-group A and 15.57±2.31 min in-group B. The observed average onset of sensory blockade was 6.13±0.86 min in group A and 4.23±0.73 min in group B. Conclusion: The randomized study of Brachial plexus block with local anaesthetics, with and without Dexamethasone has revealed that postoperative analgesia has been found to be significantly prolonged in the Dexamethasone group and can be used safely.

Keywords: Dexamethasone, Anaesthetic, Supra clavicular & Brachial.

INTRODUCTION

Cocaine was the first local anaesthetic extracted from Erythroxylon coca by Niemann. Carl Koller later brought into light the anaesthetic properties of Cocaine by insensitizing the frog’s and rabbit’s cornea with Cocaine [1]. In search of better local anaesthetic than Cocaine derivatives, which were labile, short acting, produced allergic reactions, the aminoamide derivatives were synthesized.

Lofgren and Lundqvist in 1943 synthesized Lidocaine. It was brought into clinical practice by Gordh in 1947. Ekenstam pioneered the synthesis of chain of aminoamides Bupivacaine, Mepivacaine, and Ropivacaine. Bupivacaine, a long acting local anaesthetic was introduced in 1963 to clinical practice by Telivuo [2].

Brachial plexus was first blocked by William Stewart Halsted in 1884 using Cocaine. He blocked the nerve roots and separated the cords and nerves later. Crile disarticulated the shoulder joint by blocking nerve trunks under direct vision [3]. It was Hirschel in 1911 who described percutaneous technique for blockingplexus by making separate injections above and below the axillary artery using four inch needle directed towards the apex of axilla [4].

Brachial plexus provides the motor innervation and nearly all sensory supply of the upper limb. The plexus is formed by the anterior primary rami of fifth, sixth, seventh, eighth cervical and first thoracic nerves. Sometimes the plexus is derived mainly from fourth to eighth cervical nerve (prefixed plexus) or from sixth cervical nerve to second thoracic nerves (post fixed plexus). The components are designated according to their location as roots, trunks, divisions, cords and branches [5]. Roots after emerging from intervertabral foramina unite to form trunks between scalene muscles. Each trunk divides into anterior and posterior divisions. The divisions in combination form cords which surrounds the axillary artery [6].

MATERIAL & METHOD

60 patients admitted to a tertiary care teaching Hospital and Research center over a period of 6 months undergoing upper limb surgery lasting more than 90 minute were included in the study. The elective surgical interventions were internal fixation of bones with plates
and screws, excision of bone cysts, reconstructive and other surgeries involving upper limb.

**Inclusion criteria:**
- Patients with ASA1 and II physical status
- the age group of 18 to 60 years
- Male & female of both sex
- Patient height more than 150 cm
- Weight more than 55 kg.

**Exclusion criteria:**
- Patients with age less than 16 and greater than 60 year,
- Patients with coagulopathy or on anti coagulants;
- Patients with peripheral neuropathy;
- Patients with history of substance abuse, local cutaneous infections;
- Pregnant or lactating female patients;
- Renal failure,
- Hepatic failure,
- Patients with allergy to local anaesthetics, dexamethasone;
- ASA class III and IV patients,
- Uncooperative patients, patient refusing, uncoporative ;
- Patchy or inadequate Anaesthesia
- Diabetes / Glucose intolerance
- Peptic disease.
- Patients undergoing emergency surgical procedures.

**RESULTS**

### Table 1: Pharmacology of Local Anaesthetics

<table>
<thead>
<tr>
<th>Physico-chemical properties</th>
<th>LIGNOCAINE</th>
<th>BUPIVACAINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular weight</td>
<td>234</td>
<td>288</td>
</tr>
<tr>
<td>pKa</td>
<td>7.8</td>
<td>8.1</td>
</tr>
<tr>
<td>Partition coefficient (lipid solubility)</td>
<td>2.9</td>
<td>28</td>
</tr>
<tr>
<td>pH</td>
<td>5 to 6 without epinephrine</td>
<td>4.5 to 5.5</td>
</tr>
<tr>
<td></td>
<td>2 to 3 with epinephrine</td>
<td></td>
</tr>
</tbody>
</table>

**Pharmacokinetics**

- **Onset of action**
  - Rapid
  - Slow
- **Duration of action**
  - 60 to 120 min
  - 240 to 480 min
- **Half life Alpha t1/2**
  - 1.0 min
  - 2.7 min
- **Beta t ½**
  - 9.6 min
  - 28 min
- **Gamma t ½**
  - 1.6 hrs
  - 3.5 hrs
- **VDSS**
  - 91 ltrs
  - 72 ltrs
- **Clearance**
  - 0.95 l/min
  - 0.47 l/min

**Metabolism**

- Oxidative de-alkylation to Monoethylglycine xylidide
- Aromatic hydrolysis, Ndealkylation, amide hydrolysis
- Protein binding
  - 70%
  - 95%
- Non ionized fraction
  - 17 to 33%
  - 11 to 24%
- Potency (Procaine)
  - 2 times more
  - 8 times more
- Toxic dosage
  - 3mg/kg without epinephrine (300 mgs max)
  - 2.5 to 3 mgs/kg (175 mg max)
- Toxic plasma concentration
  - >5 mcgs/m
  - >1.5 mcgs/ml

**Preparations**

- **Infiltration**
  - 5 and 10 mg/ml solutions 10, 15,20mg/ml solutions
  - 2.5mg/ml solution
- **Peripheral nerve blocks**
  - 10,15and 20mg/ml solutions
  - 2.5mg and 5mg/ml solutions
- **Epidural**
  - 5mg/ml solutions
  - 2.5, 5and 7.5 mg/ml
- **Spinal**
  - 2.0%Jelly, Viscous
  - 5and 7.5mg/ml solutions
- **Topical**
  - 2.5%, 5% Ointment

### Table 2: Comparison of demographic parameters

<table>
<thead>
<tr>
<th>Demographic parameters</th>
<th>Group A (n=30)</th>
<th>Group B (n=30)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years</td>
<td>33.47±0.97</td>
<td>35.07±0.98</td>
<td>0.575</td>
</tr>
<tr>
<td>Weight in kg</td>
<td>60.40±62</td>
<td>63.39±48</td>
<td>0.215</td>
</tr>
<tr>
<td>Sex</td>
<td>Male=20 (66.7%)</td>
<td>Male=21 (70.0%)</td>
<td>0.781</td>
</tr>
<tr>
<td></td>
<td>Female=10 (33.3%)</td>
<td>Female=9 (30.0%)</td>
<td></td>
</tr>
<tr>
<td>Inference</td>
<td>Samples are age, sex and Weight matched with P&gt;0.05</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The above table shows that the average age was 33.37±10.98 yrs in-group A and 35.07±10.98 yrs in-group B. The average weights of the patients were 60.40±8.62 kgs in-group A and 63.39±48 in-group B respectively. Both groups had predominantly male patients, accounting for nearly 2/3 of the total study population in each group. There was no significant difference in age, weight and sex distribution.

### Table 3: Comparison of Study parameters between two groups

<table>
<thead>
<tr>
<th>Study Parameter</th>
<th>Group A (n=30)</th>
<th>Group B (n=30)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time of onset (Minutes)</td>
<td>20.13±3.50</td>
<td>15.57±2.31</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Onset of sensory blockade (minutes)</td>
<td>6.13±0.86</td>
<td>4.23±0.73</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

In the above chart the average time of onset was 20.13±3.50 min in-group A and 15.57±2.31 min in-group B. The observed average onset of sensory blockade was 6.13±0.86 min in group A and 4.23±0.73 min in group B.

### DISCUSSION

Varieties of receptors mediate nociception in peripheral sensory nerve fibers. The knowledge of these receptors has been used in the form of various adjuncts administered along with local anesthetics. These adjuncts may not only prolong the analgesic duration but also thought to reduce the systemic analgesic consumption as well as their side effects [7]. To prolong perioperative analgesia various adjuncts such as opioids, clonidine, verapamil, neostigmine and tramadol have been tried. Although the role of dexamethasone as an adjunct has been debated over a long period, it is still in regular use. The objective of this study was to compare the analgesic efficacy with or with dexamethasone as adjuncts to local anaesthetics in brachial plexus block [8].

The study was a prospective, randomized, double blind study carried out at MYH Indore. Sixty patients belonging to ASA I and II physical status patients undergoing upper limb surgeries were included in the study. Patients were divided into two groups of thirty each.

Group A (n=30): Received brachial plexus block with 2% lignocaine with adrenaline at the dose of 14 ml and 0.5% bupivacaine 16ml to the solution.

Group B (n=30): Received brachial plexus block with 2% lignocaine with adrenaline 14 ml and 0.5% bupivacaine 16ml 2mg/kg along with dexamethasone 4mg into the solution.

In our study we observed that there was change in the time of onset of action and duration of analgesia between two groups [9]. The pH of the injected solution around the nerve would certainly influence the onset of action.

### CONCLUSION

The randomized study of Brachial plexus block with local anaesthetics, with and without Dexamethasone has revealed that postoperative analgesia has been found to be significantly prolonged in the Dexamethasone group and can be used safely.

### REFERENCES