A comparative study to evaluate the effect of different doses of dexamethasone as an adjuvant to 0.5% ropivacaine on duration of analgesia and motor block in supraclavicular brachial plexus blockade

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Abstract:

Background & Method: The aim of the study is to study a comparative study to evaluate the effect of different doses of dexamethasone as an adjuvant to 0.5% ropivacaine on duration of analgesia and motor block in supraclavicular brachial plexus blockade. After obtaining approval from ethical committee 100 patients who will fulfill the eligibility criteria will be studied with informed and written consent, subsequently patients will be randomized into four groups of 25 each.

Result: Onset time of sensory blockade was 18.68±3.34 min in Group RA, 10.78±1.44 min in Group RB, 10.05±1.82 min in Group RC and 9.66±2.22 min in Group RD. Duration of sensory blockade is 327.6±55.81 min in Group RA, 473.92±31.83 min in Group RB, 481.57±32.21 min in Group RC and 496.67±30.18 min in Group RD.

Conclusion: Dexamethasone when added to ropivacaine fastens the onset of sensory and motor blockade as compared to ropivacaine alone. Dexamethasone when added to ropivacaine prolongs the duration of sensory and motor blockade. After performing the supraclavicular brachial plexus block patients were observed for — Onset and duration of sensory and motor blockade, duration of analgesia, VAS score at the time of rescue analgesia, sedation, hemodynamic and respiratory parameters, side-effects and complications. Observation, tabulation, statistical analysis done using ANOVA test and paired student t test. In this study demographic data like Age and weight of all the three groups were comparable and were found to be statistically insignificant (p>0.05).

Keywords: onset, ropivacaine, supraclavicular, brachial & plexus block.

Study Designed: Comparative Study.

1. INTRODUCTION

Pain is not just merely a sensory modality but an experience. According to International Association for the study of Pain, pain is defined as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such
damage[1]”. This definition recognizes the interplay between the objective, physiological sensory aspect of pain and its subjective, emotional and psychological components.

Brachial plexus block is a popular approach for upper limb surgeries as an alternative to general anaesthesia. This type of anaesthesia mainly helps in to achieve ideal operating conditions by producing muscular relaxation, maintaining stable intraoperative hemodynamic condition and sympathetic block which reduces postoperative pain, vasospasm and edema.[2]

The available literature has also shown that this type of block mainly avoids the untoward effects of general anesthesia including upper airway instrumentation and thus prevents the consequences of it. It has also been shown that it is attractive due to its effectiveness in terms of cost and performance, margin of safety, along with good postoperative analgesia.[3] A variety of approaches of brachial plexus block have been described in the literature. However supraclavicular block is a consistent and easiest method for anesthesia and post operative pain Management. Supraclavicular block provides a rapid, dense, and predictable anesthesia of the entire upper extremity in most consistent manner of any brachial plexus technique.[4] Brachial plexus is blocked where it is most compact i.e. at the middle of brachial plexus, resulting in homogenous spread of anaesthetic throughout the plexus with a fast onset and complete block.[5]

Local anesthetics alone for supraclavicular brachial plexus block provide good operative conditions but have shorter duration of postoperative analgesia. Hence, various adjuvants like opioids, clonidine, neostigmine, dexamethasone, midazolam, etc., were added to local anesthetics in brachial plexus block to achieve quick, dense, and prolonged block, but the results are either inconclusive or associated with side effects. The steroids have been shown to reduce the inflammation and also have shown analgesic effects. The pain relief after administration of steroids is due to reduction of inflammation by inhibition of Phospholipase A2 and also blocks the transmission in nociceptive C – fibers to reduce the pain.[6] Phospholipase A2 has been found to induce membrane injury and edema by generating inflammatory mediators. It is the enzyme responsible for liberation of arachidonic acid leading to the production of prostaglandins and leukotriones. They also sensitize small neurons and enhance pain generation by abnormal conduction and intraneural edema.[7]

2. MATERIAL & METHOD

The present study entitled “A comparative study to evaluate the effect of different doses of dexamethasone as an adjuvant to 0.5% ropivacaine on duration of analgesia and motor block in supraclavicular brachial plexus blockade” was carried out in Department of Anaesthesiology, J.A. Group of Hospitals and G.R. Medical College, Gwalior (M.P.) from Jan 2018 Dec 2019 duration 02 years after approval from ethical committee in 100 patients of ASA grade I and II scheduled for upper limb surgeries.

Inclusion Criteria:
• 100 patients of ASA grade I and II.
• Both sex of age group - 18-60 yr
• Controlled diabetic patients

Exclusion Criteria:
Following patient will not be included in the study:
• Age < 18 yr. or > 60 yr.
Female pregnant patients
- History of allergy/sensitivity to amide type of local anaesthetic agent.
- Hypertensive patient.
- History of significant neurological, psychiatric or neuromuscular disorder, Renal dysfunction, Cardiac diseases, Liver diseases, bleeding disorders.
- Parturient and lactating women
- Patients with incomplete or partial block

Complete preanaesthetic check up of these patients will be done with following investigation will be done:
- Urine (Routine and microscopic)
- Hemoglobin
- Total leukocyte count & Differential leukocyte count
- Blood sugar
- Blood urea, serum creatinine
- Chest x-ray PA view
- ECG

After obtaining approval from ethical committee 100 patients who will fulfill the eligibility criteria will be studied with informed and written consent, subsequently patients will be randomized into four groups of 25 each.

### 3. RESULTS

#### Table 1: Group distribution

<table>
<thead>
<tr>
<th>Groups</th>
<th>Study drugs and its doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group RA (n=25)</td>
<td>30 ml of 0.5% ropivacaine</td>
</tr>
<tr>
<td>Group RB (n=25)</td>
<td>30 ml of 0.5% ropivacaine with 1 mg dexamethasone</td>
</tr>
<tr>
<td>Group RC (n=25)</td>
<td>30 ml of 0.5% ropivacaine with 2 mg dexamethasone</td>
</tr>
<tr>
<td>Group RD (n=25)</td>
<td>30 ml of 0.5% ropivacaine with 4 mg dexamethasone</td>
</tr>
</tbody>
</table>

#### Table 2: Demographic profile

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Group RA</th>
<th>Group RB</th>
<th>Group RC</th>
<th>Group RD</th>
<th>F value</th>
<th>ANOVA p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>Mean 38.24 ±SD 9.65</td>
<td>Mean 39.64 ±SD 6.37</td>
<td>Mean 40.36 ±SD 7.65</td>
<td>Mean 39.36 ±SD 6.41</td>
<td>0.145</td>
<td>0.933</td>
</tr>
</tbody>
</table>
Table 2 showing demographic profile of patients in three groups according to age, weight and sex. Statistical analysis of Mean ±SD of Age and Weight of the groups were comparable in all three groups and statistically insignificant (p≥0.05).

$ Statistically significant p≤0.05$

# Statistically insignificant p≥0.05

Table 3: Sensory blockade

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean ±SD</th>
<th>Mean ±SD</th>
<th>Mean ±SD</th>
<th>Mean ±SD</th>
<th>F value</th>
<th>ANOVA p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA</td>
<td>18.68 ±3.34</td>
<td>10.78 ±1.44</td>
<td>10.05 ±1.81</td>
<td>9.66 ±2.25</td>
<td>88.313</td>
<td>.000</td>
</tr>
<tr>
<td>RB</td>
<td>55.8 ±3.82</td>
<td>17.37 ±1.995</td>
<td>16.34 ±2.681</td>
<td>15.77 ±2.312</td>
<td>38.611</td>
<td>.000</td>
</tr>
</tbody>
</table>

Table 3 Showing mean ±SD of onset and duration of sensory blockade. Onset time of sensory blockade was 18.68±3.34 min in Group RA, 10.78±1.44 min in Group RB, 10.05±1.82 min in Group RC and 9.66±2.22 min in Group RD. Duration of sensory blockade is 327.6±55.81 min in Group RA, 473.92±31.83 min in Group RB, 481.57±32.21 min in Group RC and 496.67±30.18 min in Group RD.

As ANOVA p value is <.0001 Applying TUKEY HSD (honest significant difference) test, Difference between group RA and RB and Group RC and RD were statistically significant (p <0.05) for onset of sensory blockade. Difference between group RA vs RB, group RA vs RC and RA vs RD were statistically significant (p <0.05) for duration of sensory blockade.

$ Statistically significant p≤0.05$

# Statistically insignificant p≥0.05

Table 4: Motor blockade

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean ±SD</th>
<th>Mean ±SD</th>
<th>Mean ±SD</th>
<th>Mean ±SD</th>
<th>F value</th>
<th>ANOVA p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA</td>
<td>23.24 ±3.82</td>
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<td>16.34 ±2.681</td>
<td>15.77 ±2.312</td>
<td>38.611</td>
<td>.000</td>
</tr>
</tbody>
</table>
motor block & Duration of motor block & 297.5 & 34.67 & 407.3 & 41.64 & 414.12 & 39.69 & 436.6 & 42.17 & 60.213 & .000

Table 4 Showing the onset time (Mean ±SD) of motor blockade was **23.24±3.82** min in Group RA, **17.37±1.99** min in Group RB & **16.34±2.68** min in Group RC and **15.77±2.31** min in Group RD

The duration of motor blockade (Mean ±SD) was found to be **297.5±34.67** min in Group RA, **407.3±41.64** min in Group RB & **414.12±39.69** min in Group RC and **436±42.17** min in Group RD As ANOVA p value is <.0001. Applying TUKEY HSD (honest significant difference) test Difference between Group RA and Group RB and group RC and RD were statistically significant (p <0.05) for onset of motor blockade. Difference between group RA vs RB, group RA vs RC and RA vs RD were statistically significant (p <0.05) for duration of motor blockade

4. DISCUSSION

Onset time of sensory blockade was 18.68±3.34 min in Group RA, 10.78±1.44 min in Group RB,10.05±1.82 min in Group RC and 9.66±2.22 min in Group RD. Duration of sensory blockade is 327.6±55.81 min in Group RA,473.92±31.83 min in Group RB ,481.57±32.21 min in Group RC and 496.67±30.18 min in Group RD. As ANOVA p value is <.0001 Applying TUKEY HSD (honest significant difference) test, Difference between group RA and RB and Group RC and RD were statistically significant (p <0.05) for onset of sensory blockade. Difference between group RA vs RB, group RA vs RC and RA vs RD were statistically significant (p <0.05) for duration of sensory blockade.

Our observations are in accordance with the findings of Alarasan et al[8] in which they found that The onset of sensory block was significantly earlier in dexamethasone group (10.36 ± 1.99 ) minutes compared to control group (12.9 ± 2.23 ) minute. The duration of sensory block was significantly prolonged in dexamethasone group (366 ± 28.11) minutes compared to control group (242.66 ± 26.38)

Our observations are also in accordance with the study of ofDhumane et al.[9] They also find the same results when adding 8 mg dexamethasone in supraclavicular brachial plexus block. The difference in onset of sensory block between two groups was statistically highly significant(p=0.01).The difference in duration of sensory block between group was statistically highly significant(p=0.03).

Our observations are also in accordance with study of Mamdouh et al,[10] in which they find that addition of dexamethasone to low volume bupivacaine in SBPB significantly decreases the onset time and significantly prolonged the duration of sensory block. Our observation are also in accordance with study of Choi S et al.[11] in which patients receiving dexamethasone as an adjuvant have longer duration of sensory blockade. Cummings et al[12] also found same results in their study in interscalene block using dexamethasone as an adjuvant with bupivacaine and ropivacaine.
Our observations are also in accordance with the study of Biradar et al.[13] The onset of sensory blockade (13.4±2.8 vs. 16.0±2.3 min ) were significantly more rapid in the dexamethasone group than in the control group ( P=0.001). The duration of sensory blockade (326±58.6 vs. 159±20.) were significantly longer in the dexamethasone group than in the control group ( P=0.001).

5. CONCLUSION

Dexamethasone when added to ropivacaine fastens the onset of sensory and motor blockade as compared to ropivacaine alone. Dexamethasone when added to ropivacaine prolongs the duration of sensory and motor blockade. After performing the supraclavicular brachial plexus block patients were observed for – Onset and duration of sensory and motor blockade, duration of analgesia, VAS score at the time of rescue analgesia, sedation, hemodynamic and respiratory parameters, side-effects and complications. Observation, tabulation, statistical analysis done using ANOVA test and paired student t test. In this study demographic data like Age and weight of all the three groups were comparable and were found to be statistically insignificant(p>0.05).

6. REFERENCES


