Comparison of Dexmedetomidine and Dexamethasone as Adjuvant to Bupivacaine in Supraclavicular Brachial Plexus Block

Saadia Khaleeq, 1 Muhammad Azam, 2 Sana Siddiq, 3 Adeel Shahid, 4 Zulqarnain Butt, 5 Naila Asad 6

1, 2, 3, 4, 6 Department of Anesthesia SIMS/Services Hospital, Lahore-Pakistan, 5 Department of Anesthesia, Avicenna Medical College, Lahore-Pakistan

ABSTRACT

Objective: Brachial plexus block is one of the commonly used anesthetic technique for upper limb procedures in orthopedics. A number of drugs have been used as adjuvants to local anesthetic agents, to prolong the duration and enhance the quality of the block. Some of these are clonidine, dexmedetomidine, ketamine, dexamethasone and magnesium sulfate. We conducted this study to evaluate dexmedetomidine and dexamethasone with respect to the onset and duration of sensorimotor block. Their effects on hemodynamic parameters as well as duration of analgesia after surgery were also recorded. Study Design: Prospective Randomized controlled design. Settings: Anesthesia, ICU and pain management department of Services Hospital/SIMS, Lahore Pakistan. Duration: From 15th September 2019 till 15th March 2020. Methodology: Sixty patients fulfilling the inclusion criteria were enrolled in the study after taking informed written consent for upper limb procedures under supraclavicular brachial plexus block. These patients were divided into two groups BD and BG with 30 patients in each group. Patients in Group BD received 32ml of 0.375% bupivacaine (30 ml) with 100microgram of dexmedetomidine (2ml). Group BG patients received 32ml of 0.375% bupivacaine (30ml) with 8mg of dexamethasone (2ml). The onset and duration of sensory and motor block, time to request for first rescue analgesic and hemodynamic changes in both groups of patients were recorded. Results: The results of our study revealed that the patients in group BD had earlier onset and longer duration of sensory and motor block with minimal hemodynamic changes. Conclusion: Dexmedetomidine is superior to dexamethasone as an adjuvant, in terms of rapid onset and prolonged duration of sensorimotor block and postoperative analgesia after supraclavicular block, with minimal hemodynamic changes.

Keywords: Supraclavicular brachial plexus block, Bupivacaine, Dexmedetomidine, Dexamethasone.

INTRODUCTION

The introduction of safer techniques has tremendously increased the popularity of peripheral nerve blocks in recent years leading to frequent use of these for anesthesia and postoperative analgesia. Those patients who are considered unfit for general anesthesia can be anesthetized without hesitation due to the availability of newer techniques to perform nerve blocks. 1 Upper extremity orthopedic procedures can be safely done under brachial plexus block without general anesthesia. Brachial plexus block, when performed through supraclavicular approach, provides consistent, reliable and uniform anesthesia. It adds to the quality of postoperative pain relief and patient satisfaction. 2 Bupivacaine is the most commonly used local anesthetic agent in our set up because of its free availability and longer duration of action. However, it has some disadvantages like slow onset, patchy effect and the potential to cause systemic toxicity due to possible intravascular injection of a large dose. 3 Different drugs have been used as perineural adjuvants to local anesthetics in an attempt to enhance the quality and duration of single shot nerve blocks. 4 The glucocorticoid dexamethasone, is well known for its anti-inflammatory as well as analgesic properties. 5 These properties are due to blockade of nociceptive C fibers and phospholipid A 2 . 6 Although its role as a perineural adjuvant is well recognized elsewhere, such studies are sparse in Pakistan. 7 Dexmedetomidine, a drug recently introduced in our country, is being increasingly used in intravenous regional anesthesia, procedural sedation and analgesia in ICU setting. It is also known to improve the quality of central neuraxial blocks. In recent years, it has been used as an adjuvant to local anesthetics while performing peripheral nerve blocks. 8, 9 We designed this study to compare the effectiveness of the two drugs as an adjuvant to 0.375% bupivacaine for supraclavicular brachial plexus block, to choose the better one for routine practice of regional anesthesia in our setup.

METHODOLOGY

Study Design: Prospective Randomized Controlled design. Settings: Anesthesia, ICU and pain management department of Services Hospital/SIMS, Lahore Pakistan. Duration: Six months from September 15, 2019 to March 14 2020. Data Collection Procedure: After the approval by Institutional Ethical Review Board and obtaining informed consent, sixty patients were included in this trial. Patients with preexisting neurological deficit, diabetes mellitus, abnormal ECG, taking steroids and allergic to study drugs were excluded. Patients were divided into two groups, BD and BG, randomly by

DOI: 10.29054/APMC/2020.889

Corresponding Author

Dr. Saadia Khaleeq, Assistant Professor of Anesthesia, SIMS/Services Hospital Lahore-Pakistan
Email: saadia.razae64@gmail.com

Citation: Khaleeq S, Azam M, Siddiq S, Shahid A, Butt Z, Asad N. Comparison of Dexmedetomidine and Dexamethasone as Adjuvant to Bupivacaine in Supraclavicular Brachial Plexus Block. APMC 2020;14(2):122-5.
Comparison of Dexmedetomidine and Dexamethasone

Khaleeq S et al.

RESULTS
The two study groups were comparable in terms of demographic data without significant statistical difference (Table1).

Table 1: Demographic data

<table>
<thead>
<tr>
<th></th>
<th>Dexmedetomidine (Group BD) (Mean ± SD)</th>
<th>Dexamethasone (Group BG) (Mean ± SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>40.77±14.52</td>
<td>39.57±11.97</td>
<td></td>
</tr>
<tr>
<td>Gender (M:F)</td>
<td>15:15</td>
<td>17:13</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Efficacy of dexmedetomidine and dexamethasone

<table>
<thead>
<tr>
<th>Sensory Block</th>
<th>Onset (min)</th>
<th>Duration (min)</th>
<th>Motor Block</th>
<th>Onset (min)</th>
<th>Duration (min)</th>
<th>Time to request for first rescue Analgesic (min)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dexmedetomidine (Group BD) (Mean ±SD)</td>
<td>19.5±4.2</td>
<td>876±236.12</td>
<td>30.67±3.88</td>
<td>77.33±198.23</td>
<td>1015.5±245.98</td>
<td>907.5±196.74</td>
<td>0.000</td>
</tr>
<tr>
<td>Dexamethasone (Group BG) (Mean ±SD)</td>
<td>23.5±3.7</td>
<td>659.6±177.2</td>
<td>34±3.80</td>
<td>564±153.27</td>
<td>807.5±196.74</td>
<td>0.000</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Side effects of dexmedetomidine and dexamethasone

<table>
<thead>
<tr>
<th>Side Effects</th>
<th>Patients Receiving Dexmedetomidine (BD)</th>
<th>Patients Receiving Dexamethasone (BG)</th>
<th>Total (N)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bradycardia</td>
<td>Yes</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>27</td>
<td>28</td>
<td>55</td>
</tr>
<tr>
<td>Hypotension</td>
<td>Yes</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>29</td>
<td>28</td>
<td>60</td>
</tr>
<tr>
<td>Nausea/Vomiting</td>
<td>Yes</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>30</td>
<td>30</td>
<td>60</td>
</tr>
</tbody>
</table>
DISCUSSION

Regional anesthesia in orthopedic procedures is superior to general anesthesia in terms of better postoperative pain relief, less central nervous system depressant effect of drugs and early discharge from hospital.\(^\text{10}\)

Brachial plexus block is a convenient and commonly used regional anesthetic technique for upper limb surgical procedures. Although different approaches are available but we selected supraclavicular approach as it is a simple and safe technique for anesthesia and analgesia for surgeries below the shoulder joint.\(^\text{11}\) In these blocks various drugs like clonidine, buprenorphine, ketamine and dexmedetomidine have been used as adjuvants to local anesthetic drugs to speed up the onset, prolong the duration and improve the quality of block.\(^\text{12}\)

Dexmedetomidine has been used as perineural adjuvant to local anesthetic drugs in different regional and peripheral nerve blocks and has been proven to be an excellent choice in potentiating local anesthetic effect.

The current study has shown that dexmedetomidine when used as an adjuvant to bupivacaine in supraclavicular brachial plexus block, leads to rapid onset and significantly longer duration of sensory and motor blockade as compared to dexamethasone (p=0.000). Duration of analgesia after surgery was also prolonged in patients receiving dexmedetomidine (p=0.001). Moreover, no significant hemodynamic changes were observed.

El-Sayed et al (2019) compared dexamethasone and dexmedetomidine as adjuvants to bupivacaine in infraorbital block for cleft lip repair. They observed a significantly lower postoperative FLACC pain scale (face, legs, activity, cry and Consolability scoring for pediatric analgesia) and a longer time to first analgesic request that is 690 minutes with dexmedetomidine as compared to 546 minutes with dexamethasone.\(^\text{15}\) These results were quite similar to our findings.

Hamda et al (2019) in a study with these same drugs for supraclavicular block, found that dexmedetomidine has more profound inhibitory effect on unmyelinated C fibers for pain than A alpha motor fibers.\(^\text{14}\) We also concluded that dexmedetomidine causes longer duration of sensory block as compared to motor blockade.

Another study conducted by Wei et al (2018) showed that addition of dexmedetomidine to ropivacaine caused rapid onset and prolonged duration of sensory as well as motor blockade when compared with ropivacaine alone. They also noted that dexmedetomidine did not cause any significant hemodynamic changes irrespective of the dosage used. Their results are quite consistent with our findings.

In their study Karanam et al (2017) comparing two doses of dexmedetomidine (50 and 100 micrograms) as adjuvants to bupivacaine in supraclavicular block observed a significantly early onset of sensory (p=0.026) and motor block (p=0.032) with 100 microgram dexmedetomidine. Although the incidence of bradycardia was higher with this dose (p=0.009), hypotension recorded was not statistically significant (p=0.056).\(^\text{16}\)

In our patients, 100 microgram dexmedetomidine did not cause significant hypotension (p=0.64) or bradycardia (p=0.55).

Another study with the findings consistent our study results was conducted by Arun et al (2018). They compared duration of sensory and motor blockade and postoperative analgesia after axillary block with dexmedetomidine and dexamethasone as adjuvants to bupivacaine. They found that the duration of sensory and motor blockade and postoperative analgesia was significantly more in dexmedetomidine group (p<0.001).\(^\text{17}\)

Another study conducted by Lee et al (2016), compared the effect of dexmedetomidine 100 microgram and dexamethasone 10 mg as local anesthetic adjuvants and local anesthetic alone in axillary brachial plexus block. Contradictory to our results, they did not find significant difference among the effect of adjuvants dexmedetomidine and dexamethasone when added to local anesthetic (p value >0.05).\(^\text{18}\) This effect may be due to increased dose of dexamethasone (10 mg) in their study. We used only 8 mg of dexamethasone.

Alise J and coworkers (2019) compared perineural dexamethasone and dexmedetomidine for infraclavicular block. They concluded that dexamethasone used as an adjuvant results in better sensorimotor blockade and analgesic duration (p<0.001).\(^\text{19}\) Their findings were different from our results. This could be due to increased total volume (35ml) used in their study while we used only 32 ml.

CONCLUSION

In the light of the above, we conclude that dexmedetomidine is a better choice as an adjuvant to local anesthetics to enhance the quality and duration of nerve block without significant cardiovascular changes.

LIMITATIONS

Our study was limited in that we included only ASA I and ASA II (physical status according to American Society of Anesthesiologists) patients. We also might have missed any delayed complications due to the block as the patients were not followed beyond 24 hours postoperatively.

SUGGESTIONS / RECOMMENDATIONS

In future more studies can be done with different doses of dexmedetomidine and in patients with comorbidities.

CONFLICT OF INTEREST / DISCLOSURE

None.

ACKNOWLEDGEMENTS

We acknowledge the full support and guidance provided to us by Professor Naila Asad and Dr. Mohammed Ashfaque.

REFERENCES


AUTHORSHIP CONTRIBUTION

Saadia Khaleeq
Muhammad Azam
Sana Siddiq
Adeel Shahid
Zulqarnain Butt
Naila Asad

Basic concept & design of work
Interpretation & analysis of data
Data collection & data analysis
Data collection & final drafting
Data collection & data analysis
Data analysis & discussion writing