Introduction

- The search for adjuncts in regional anesthesia has lead to the addition of epinephrine, clonidine, tramadol, neostigmine and dexamethasone perinervously.
- The ideal adjunct prolongs the duration of analgesia, speeds the onset of action and improves the quality of the blockade.
- Despite the existence of several randomized controlled trials reporting improved duration of analgesia with dexamethasone, this adjunct is scarcely used in many institutions.
- The goal of this study was to review the available literature and use meta-analysis to quantitatively assess the utility of dexamethasone as an adjunct in regional anesthesia, specifically brachial plexus blockade.

Materials and Methods

- A literature search was conducted on the use of dexamethasone in regional anesthesia using PubMed, Ovid and Cochrane databases, including the reference sections of relevant articles.
- Inclusion criteria stipulated only prospective/randomized trials of adult patients undergoing brachial plexus blockade be included, that studies directly compare the use of local anesthetics (LA) alone to LA plus perineural dexamethasone (LA+D) and that outcome data be presented in a format suitable for comparative analysis.
- Outcomes of interest included duration of analgesia and onset/offset of sensory and motor blockade.
- Random-effects meta-analysis was used to compute effect sizes and compare LA+D groups.
- Results were considered statistically significant if P < 0.05.
- Analysis of publication bias was completed for all study outcomes.

Results

- Four studies (246 patients) met criteria for inclusion. A statistically significant difference in favor of LA+D was found for duration of analgesia (difference in means 427.85 min, 95% CI [270.34-573.46], P<0.001).
- The prolongation of analgesia was found to be significant irrespective of dexamethasone dose (4 vs. 8mg) or approach to the brachial plexus (interscalene vs. supraclavicular vs. axillary).
- A statistically significant prolongation of the duration of motor blockade was observed for LA+D (difference in means 457.11 min, 95% CI [294.72-619.49], P<0.001).
- No significant difference was found in the onset of sensory or motor blockade.
- Analysis of publication bias for duration of analgesia revealed one “file drawer publication” to the left of the mean, however, the addition of imputed data had no effect of the statistical significance of our previous findings.

Discussion

- Adjuncts have been added to regional blockades with the goal of prolonging duration, improving the quality of the blockade, and speeding the onset.
- Dexamethasone functions as an adjunct by its proposed anti-inflammatory and analgesic properties. The anti-inflammatory action is attributed to the block of the nociceptive signal transmission along myelinated C-fibers. Another proposed mechanism of dexamethasone is the increased activity of inhibitory potassium channels via glucocorticoid receptors on nociceptive C-fibers.
- Concerns over hyperglycemia, wound healing, neuronal damage and rebound hypalgesia have been debated in recent literature, questioning the use of perineural dexamethasone.
- With no FDA approval or dosing guidelines established for perineural administration, safety concerns have been brought up about larger dosages of dexamethasone causing neuronal cytotoxicity with local anesthetics.
- While prolongation of brachial plexus blockade is evident with the use of dexamethasone perinervously (as demonstrated both in this meta-analysis of available randomized trials and another recent meta-analysis), concerns first need to be addressed before its widespread implementation.

Table 1: Individual study details.

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Country</th>
<th>N</th>
<th>Block</th>
<th>LA+D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shrestha1</td>
<td>2003</td>
<td>Nepal</td>
<td>60</td>
<td>Supraclavicular</td>
<td>1b</td>
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<tr>
<td>Moodgok2</td>
<td>2005</td>
<td>Iran</td>
<td>60</td>
<td>Axillary</td>
<td>1b</td>
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<td>Yadav3</td>
<td>2008</td>
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<td>60</td>
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<tr>
<td>Tandon4</td>
<td>2011</td>
<td>USA</td>
<td>50</td>
<td>Intercostal</td>
<td>1b</td>
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</table>

Table 2: Effect size data for outcome of interest.

<table>
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<tr>
<th>Outcome</th>
<th>LA vs. LA+D</th>
<th>Trials</th>
<th>Effect size</th>
<th>Lower 95%</th>
<th>Upper 95%</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of Analgesia (min)</td>
<td>4mg</td>
<td>D, T</td>
<td>303 (92) 128 (11)</td>
<td>649 (24)</td>
<td>0.004</td>
<td>0.881</td>
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<td></td>
<td>8mg</td>
<td>D, T</td>
<td>457 (69) 198 (21)</td>
<td>853 (10)</td>
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<td></td>
<td>Intercostal</td>
<td>D, T</td>
<td>619 (25) 143 (6)</td>
<td>793 (86)</td>
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<tr>
<td></td>
<td>Supraclavicular</td>
<td>D, T</td>
<td>410 (36) 127 (40)</td>
<td>710 (67)</td>
<td>0.005</td>
<td>0.001</td>
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</tbody>
</table>

References