Dexmedetomidine as a perineural adjunct for peripheral nerve blocks

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Disclosure

Kaiser Permanente South San Francisco has determined that the speaker (Dr. Fong) and the planning committee (Dr. Zheng, Dr. Yap, Dr. Ginsberg, Rebecca Bayrer, Heather Miller) for this activity do not have any relevant financial relationships. Kaiser Permanente South San Francisco takes responsibility for the content, quality, and scientific integrity of this CME Activity.

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Our questions

• Reduce time to onset of block?
• Prolong sensory block?
• Prolong motor block?
• Are patients more sedated?
• Adverse hemodynamic profile?
Dexmedetomidine

• Blocks hyperpolarization-activated cation current $\rightarrow$ prolongs hyperpolarization of nerve
• More pronounced in unmyelinated C fibers (pain) than in A$\alpha$ fibers (motor)
• Prolongs sensory more than motor?
• 8-fold greater affinity for $\alpha_2$-adrenergic receptors than clonidine
• Indirect actions: central analgesia, vasodilatation, anti-inflammatory
• Approved by FDA for IV sedation in the ICU; off-label uses are intrathecal, epidural, and perineural administration
At the resting potential, all voltage-gated Na⁺ channels and most voltage-gated K⁺ channels are closed. The Na⁺/K⁺ transporter pumps K⁺ ions into the cell and Na⁺ ions out.
Depolarization / Repolarization

In response to a depolarization, some Na⁺ channels open, allowing Na⁺ ions to enter the cell. The membrane starts to depolarize (the charge across the membrane lessens). If the threshold of excitation is reached, all the Na⁺ channels open.

By Robert Bear and David Rintoul - http://cnx.org/content/m47519/1.1/, CC BY 4.0, https://commons.wikimedia.org/w/index.php?curid=53237205
Hyperpolarization

Neuron has natural permeability to Na and Ca (influx) which allows return to resting membrane potential. Dexmedetomidine blocks this cation current and prolongs hyperpolarization.
Dexmedetomidine and Lower Ext. Blocks

• Most studies looked at brachial plexus blocks
  • Interscalene, supraclavicular, infraclavicular, axillary
• Fewer studies for lower ext. blocks
Original Article

The effects of perineural dexmedetomidine on the pharmacodynamic profile of femoral nerve block: a dose-finding randomised, controlled, double-blind study

M. Abdulatif,1 M. Fawzy,1 H. Nassar,2 A. Hasanin,2 M. Ollaek3 and H. Mohamed3

1 Professor, 2 Lecturer, 3 Assistant Lecturer, Anaesthetic Department, Faculty of Medicine, Cairo University, Cairo, Egypt
• Patients undergoing arthroscopic ACL reconstruction under GA
• Primary study outcome: duration of sensory block
• All had ultrasound-guided femoral nerve block prior to GA
• Control Group
  • Bupivacaine 0.5% 25cc + NS 1cc (n=15)
• Study Groups
  • Bupivacaine 0.5% 25cc + 25ug dexmedetomidine (n=15)
  • Bupivacaine 0.5% 25cc + 50ug dexmedetomidine (n=15)
  • Bupivacaine 0.5% 25cc + 75ug dexmedetomidine (n=15)
• Assessed sensory and motor block q5min x 30 min preop, then postop q2hr until return of function

<table>
<thead>
<tr>
<th>Data</th>
<th>Control n = 15</th>
<th>Dexmedetomidine 25 µg n = 15</th>
<th>Dexmedetomidine 50 µg n = 15</th>
<th>Dexmedetomidine 75 µg n = 15</th>
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</thead>
<tbody>
<tr>
<td>Age; years</td>
<td>27.9 (7.3)</td>
<td>28.2 (8.6)</td>
<td>31.7 (7.9)</td>
<td>27.4 (6.4)</td>
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<tr>
<td>Weight; kg</td>
<td>72.6 (10.8)</td>
<td>73.6 (7.9)</td>
<td>75.8 (6.3)</td>
<td>70.3 (9.6)</td>
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<td>Sex; male</td>
<td>13</td>
<td>15</td>
<td>15</td>
<td>12</td>
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<td>ASA physical status; 1/2</td>
<td>13/2</td>
<td>14/1</td>
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</table>
• Bradycardia is HR < 50
• Hypotension is 30% decrease of systolic BP from baseline (presumed due to systemic absorption)

50ug and 75ug groups appear to have similar curve or duration of analgesia

Figure 2 Kaplan–Meier curve for duration of analgesia. Pooled Log rank test p < 0.001. Dexmedetomidine 75 μg group (○), Dexmedetomidine 50 μg group (■), Dexmedetomidine 25 μg group (□), Control group (●).
50ug and 75ug doses

• Reduced onset time
• Extended duration of bupivacaine femoral nerve block
• Prolonged time to first request of rescue analgesia
• Reduced postop morphine requirements
• Hypotensive episodes significantly more common in 75ug group (duration?)
• 25ug dose did not potentiate bupivacaine block
  • However, another study# reported a 60% extension of duration of ropivacaine ulnar block
    with only 20ug dexmedetomidine (volunteer study)
  • Different local / Nerve? Patients vs volunteers?
• Other considerations
  • Did not comment on sedation (confounded by GA ?)
  • Statistical power to detect bradycardia differences?

#Marhofer et al. Anaesthesia 2013;110:438-42
Effect of addition of dexmedetomidine to ropivacaine 0.2% for femoral nerve block in patients undergoing unilateral total knee replacement: A randomised double-blind study

Bhawana Sharma, Sunny Rupal, Adarsh Chandra Swami, Sneh Lata
Department of Anaesthesia, Maulana Azad Medical College, New Delhi, 1Department of Anaesthesia and Intensive Care, Max Super Specialty Hospital, 2Department of Anaesthesia and Intensive Care, Fortis Hospital, Mohali, Punjab, India
• Patients undergoing unilateral TKA with spinal anesthesia
• Primary study outcome: pain scale & time to first demand of analgesia after initial bolus
• Due to residual neuraxial block, chose not to compare onset/duration of dexmedetomidine vs control
• All had femoral nerve catheter placed postop via nerve stim
• Control group (Group C):
  • Ropivacaine 0.2% 20cc + NS 2cc bolused through catheter (n=25)
• Study group (Group D):
  • Ropivacaine 0.2% 20cc + dexmedetomidine 1.5ug/kg bolused through catheter (n=25)
• All had multimodal analgesia postop with NSAID and IV acetaminophen
Time to first demand bolus increased from 2.5 to almost 6 hrs

Table 1: Demographic data values shown as mean±standard deviation

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group C (n=25)</th>
<th>Group D (n=25)</th>
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</thead>
<tbody>
<tr>
<td>Age (year)</td>
<td>64.68±7.93</td>
<td>65.72±8.97</td>
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<tr>
<td>Height (cm)</td>
<td>158.84±22.04</td>
<td>158.60±7.46</td>
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<tr>
<td>Weight (kg)</td>
<td>73.04±11.00</td>
<td>68.68±12.23</td>
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<td>Gender (female/male)</td>
<td>11/14</td>
<td>17/8</td>
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<tr>
<td>ASA Grade (I/II)</td>
<td>9/16</td>
<td>8/17</td>
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<tr>
<td>Duration of surgery (min)</td>
<td>151.2±31.8</td>
<td>141.6±29.4</td>
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</tbody>
</table>

1.5ug/kg = 100ug of dexmedetomidine
This is a slightly higher dose compared to the previous study

Is rescue analgesic similar because pain already well-controlled due to multimodal analgesia?

Table 2: Comparison of demand bolus, local anaesthetic (ropivacaine) and rescue analgesic (tramadol) consumption values shown as mean±standard deviation

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Group C (n=25)</th>
<th>Group D (n=25)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to first demand bolus (min)</td>
<td>150±115.2</td>
<td>346.8±240</td>
<td>0.001</td>
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<tr>
<td>Total number of demand bolus</td>
<td>4.24±1.48</td>
<td>2.84±1.54</td>
<td>0.002</td>
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<tr>
<td>LA consumption in 24 h (mg)</td>
<td>546.24±79.10</td>
<td>474.32±71.86</td>
<td>0.002</td>
</tr>
<tr>
<td>LA consumption in 48 h (mg)</td>
<td>1109.20±02.71</td>
<td>989.04±141.27</td>
<td>0.001</td>
</tr>
<tr>
<td>RA consumption in 24 h (mg)</td>
<td>116.67±38.34</td>
<td>100.00±0.00</td>
<td>0.185</td>
</tr>
<tr>
<td>RA consumption in 48 h</td>
<td>116.67±38.34</td>
<td>100.00±0.00</td>
<td>0.185</td>
</tr>
</tbody>
</table>

P>0.05 NS. LA – Local anaesthetic (ropivacaine); RA – Rescue analgesic (tramadol); NS – Not significant

Sharma et al. Indian J Anaesth. 2016;60:403-408
Pain scores significantly reduced in Group D at 1, 1.5, 2h postop

No significant variation in heart rate

Sharma et al. Indian J Anaesth. 2016;60:403-408
Drop in MAP significant greater in Group D, in first 8 hrs

Sedation scores higher in Group D until 4h postop

Sharma et al. Indian J Anaesth. 2016;60:403-408
• Considerations for this study:
  • Both groups had continuous ropiv infusion and blocks were done with residual neuraxial block, so authors chose not to compare onset and duration of sensory / motor blocks
  • Both groups had multimodal analgesics, which might explain comparable tramadol consumption between the two groups (i.e. all patients relatively comfortable)
  • Dexmedetomidine group had significant fall in SBP up to 8 hrs, MAP up to 4 hrs without parallel effect on HR
  • Authors believe that hemodynamic effects are due to systemic absorption, and are dose-dependent (fewer effects in other trials with lower dose)
Meta-Analyses and Systematic Reviews?

- Only a handful in Pubmed so far, and all for brachial plexus blocks
Evidence basis for using perineural dexmedetomidine to enhance the quality of brachial plexus nerve blocks: a systematic review and meta-analysis of randomized controlled trials

L. Vorobeichik\textsuperscript{1,2}, R. Brull\textsuperscript{1,3} and F. W. Abdallah\textsuperscript{1,2,4,*}

\textsuperscript{1}Department of Anaesthesia, University of Toronto, Toronto, Canada, \textsuperscript{2}Department of Anaesthesia, St. Michael’s Hospital, University of Toronto, Toronto, Canada, \textsuperscript{3}Department of Anaesthesia, Women’s College Hospital, Toronto, Canada and \textsuperscript{4}The Li Ka Shing Knowledge Institute, University of Toronto, Toronto, Canada

*Corresponding author. E-mail: abdallahf@smh.ca
• Primary outcome:
  • sensory block duration (time from injection to complete recovery)

• Secondary outcomes:
  • motor block duration
  • sensory / motor block onset times
  • duration of analgesia
  • cumulative analgesic in first 24h
  • patient satisfaction, pain relief, length of stay
  • adverse effects (bradycardia, hypotension, sedation, hypoxemia, PONV)

Vorobeichik et al. BJA. 2017;118:167-181
• Outcomes analyzed separately for each type of brachial plexus block
  • Interscalene (5 trials)
  • Supraclav (18 trials)
  • Infraclav (3 trials)
  • Axillary (8 trials)

• Trial characteristics
  • Mode of block varied (6 landmark, 20 nerve stim, 3 ultrasound, 4 nerve stim + ultrasound, 1 undefined)
  • All but one used long-acting LA (ropiv, bupiv, levobupiv)
  • Doses from 0.75-1 ug/kg, or 10-150ug flat dose
This is to show what was used for each trial

<table>
<thead>
<tr>
<th>Author</th>
<th>Surgery</th>
<th>Block use</th>
<th>N</th>
<th>Groups (n)</th>
<th>Local Anaesthetic Concentration – Total volume, and Epi dose</th>
<th>Dex dose</th>
<th>Block localization</th>
<th>Primary outcome</th>
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</thead>
<tbody>
<tr>
<td>Abdallah 2016</td>
<td>Shoulder, arthroscopic</td>
<td>Analgesic</td>
<td>99</td>
<td>1. Ropivacaine + NS (32)</td>
<td>0.5% - 15 ml epi 1:200,000</td>
<td>0.5 µg/kg</td>
<td>Ultrasound</td>
<td>Duration of analgesia</td>
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<td>2. Ropivacaine + Dex + NS IV (33)</td>
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<td>3. Ropivacaine + NS + Dex IV (34)*</td>
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<tr>
<td>Bengisun 2014</td>
<td>Shoulder, arthroscopic</td>
<td>Analgesic</td>
<td>48</td>
<td>1. Levobupivacaine (25)</td>
<td>0.5% - 20 ml epi 50 µg</td>
<td>10 µg</td>
<td>Stimulator</td>
<td>Pain scores area under the curve</td>
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<td>2. Levobupivacaine + Dex (23)</td>
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<td>Fritsch 2014</td>
<td>Shoulder, arthroscopic, open</td>
<td>Analgesic</td>
<td>61</td>
<td>1. Ropivacaine + NS (30)</td>
<td>0.5% - 10 ml</td>
<td>150 µg</td>
<td>Ultrasound</td>
<td>Duration of sensory</td>
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<td>2. Ropivacaine + Dex (31)</td>
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<td>Kumar 2014</td>
<td>Shoulder</td>
<td>Surgical</td>
<td>90</td>
<td>1. Bupivacaine + NS (30)</td>
<td>0.25% - 40 ml</td>
<td>50 µg</td>
<td>Landmark</td>
<td>N/D</td>
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<td>2. Bupivacaine + Dex (30)</td>
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<td>3. Bupivacaine + Dexamethasone (30)*</td>
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<td>Rashmi 2016</td>
<td>Upper limb</td>
<td>ND</td>
<td>60</td>
<td>1. Ropivacaine + NS (30)</td>
<td>0.75% - 30 ml</td>
<td>50 µg</td>
<td>Stimulator</td>
<td>Haemodynamic side-effects</td>
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<td>2. Ropivacaine + Dex (30)</td>
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Vorobeichik et al. BJA. 2017;118:167-181
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<tr>
<th>Supracavicular Block</th>
<th>Region</th>
<th>Surgical</th>
<th>Arch</th>
<th>Solution</th>
<th>Volume</th>
<th>Concentration</th>
<th>Device</th>
<th>N/D</th>
</tr>
</thead>
</table>
| Agarwal 2014⁵⁶      | Upper limb | ND | 50 | 1. Bupivacaine + NS (25)  
2. Bupivacaine + Dex (25) | 0.325% - 30 ml | 100 µg | Stimulator | N/D |
| Bharti 2015⁵⁵        | Upper limb | Surgical | 54 | 1. Ropivacaine + lidocaine (27)  
2. Ropivacaine + lidocaine + Dex (27) | Ropivacaine 0.325%  
Lidocaine 1% 40 ml epi 1:200,000 | 0.5% - 35 ml | 100 µg | Ultrasound + stimulator | Duration of analgesia |
| Biswas 2014⁵⁷        | Forearm, hand | Surgical | 60 | 1. Levobupivacaine + NS (30)  
2. Levobupivacaine + Dex µg (30) | 0.5% - 35 ml | 100 µg | Stimulator | N/D |
| Das 2014⁵⁸           | Distal arm, forearm, hand | Surgical | 84 | 1. Ropivacaine + NS (42)  
2. Ropivacaine + Dex (42) | 0.5% - 30 ml | 100 µg | Stimulator | Duration of analgesia |
| Das 2016⁵⁷           | Upper limb | Surgical | 80 | 1. Ropivacaine + NS (40)  
2. Ropivacaine + Dex (40) | 0.5% - 30 ml | 1 µg/kg | Stimulator | Duration of analgesia |
| Dixit 2015⁴⁴         | Upper limb | Surgical | 40 | 1. Levobupivacaine + NS (20)  
2. Levobupivacaine + Dex (20) | 0.5% - 29 ml | 1 µg/kg | ND | N/D |
| Gandhi 2012⁵⁰        | Upper limb | Surgical | 70 | 1. Bupivacaine + NS (35)  
2. Bupivacaine + Dex (35) | 0.25% - 38 ml | 30 µg | Landmark | Duration of analgesia |
| Gunajala 2015⁶²      | Distal arm, forearm, hand | Analgesic | 36 | 1. Ropivacaine + NS (18)  
2. Ropivacaine + Dex (18) | 0.5% - 35 ml | 50 µg | Stimulator | Onset of motor block |
| Kathuria 2015⁶³      | Distal arm, forearm, hand | Surgical | 60 | 1. Ropivacaine (20)  
2. Ropivacaine + Dex (20)  
3. Ropivacaine + Dex i.v. (20) | 0.5% - 30 ml | 50 µg | Ultrasound | N/D |
| Kaur 2015⁴⁵          | Upper limb | Surgical | 92 | 1. Levobupivacaine + lidocaine + NS (45)  
2. Levobupivacaine + lidocaine + Dex (45) | Levobupivacaine 0.375%  
Lidocaine 0.25% 40 ml | 0.5% - 30 ml | 1 µg/kg | Landmark | Onset of sensory block |
| Khade 2013⁴⁶         | Forearm | ND | 40 | 1. Bupivacaine + lidocaine + NS (20)  
2. Bupivacaine + lidocaine + Dex (20) | Bupivacaine 0.33%  
Lidocaine 0.66% 30 ml | 0.5% - 40 ml | 1 µg/kg | Ultrasound + stimulator | Bispectral index changes |
| Kwon 2015⁵⁸          | Forearm, hand | Surgical | 60 | 1. Ropivacaine + NS (30)  
2. Ropivacaine + Dex (30) | 0.5% - 30 ml | 50 µg | Stimulator | N/D |
| Manohar 2015⁷²       | Distal arm, forearm | Surgical | 90 | 1. Bupivacaine + NS (30)  
2. Bupivacaine + Dex (30)  
3. Bupivacaine + Fentanyl 50 µg (30) | 0.5% - 30 ml | 50 µg | Stimulator | N/D |
| Nema 2014⁴⁷          | Forearm | Surgical | 60 | 1. Ropivacaine + NS (30)  
2. Ropivacaine + Dex (30) | 0.75% - 30 ml | 50 µg | Landmark | N/D |
| Patki 2015⁴⁸         | Forearm | ND | 60 | 1. Ropivacaine + NS (30)  
2. Ropivacaine + Dex (30) | 0.5% - 30 ml | 1 µg/kg | Landmark | Duration of analgesia |
| Saraf 2016⁵³         | Upper limb | ND | 90 | 1. Ropivacaine + NS (30)  
2. Ropivacaine + Dex 25 µg (30)  
3. Ropivacaine + Dex 50 µg (30) | 0.75% - 20 ml | 2.25 µg  
3.50 µg | Stimulator | N/D |
<table>
<thead>
<tr>
<th>Block Type</th>
<th>Anatomical Location</th>
<th>Technique</th>
<th>Dose</th>
<th>Local Anesthetic</th>
<th>Route</th>
<th>Adjuvant</th>
<th>Route</th>
<th>Additional Notes</th>
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<td><strong>Infraclavicular Block</strong></td>
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<tr>
<td>Ammar 2012</td>
<td>Forearm, hand</td>
<td>Surgical</td>
<td>60</td>
<td>1. Bupivacaine + NS (30)</td>
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<td>2. Bupivacaine + Dex (30)</td>
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<tr>
<td>Mirkheshti 2014</td>
<td>Distal arm, forearm</td>
<td>Surgical</td>
<td>103</td>
<td>1. Lidocaine + NS (34)</td>
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<td>2. Lidocaine + Dex (34)</td>
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<td>3. Lidocaine + ketorolac 50 mg (35)</td>
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<td>Song 2014</td>
<td>Upper limb</td>
<td>Surgical</td>
<td>30</td>
<td>1. Mepivacaine + NS (10)</td>
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<td>2. Mepivacaine + Dex (10)</td>
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<td>3. Mepivacaine + epi 200 µg (30)</td>
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<td><strong>Axillary block</strong></td>
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<td>Arun 2016</td>
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<td>Bangera 2016</td>
<td>Forearm and hand</td>
<td>Surgical</td>
<td>80</td>
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<td>2. Ropivacaine + Dex (40)</td>
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<td>Esmaoglu 2010</td>
<td>Forearm and hand</td>
<td>Surgical</td>
<td>60</td>
<td>1. LevoBupivacaine + NS (30)</td>
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<tr>
<td>Hanoura 2013</td>
<td>Forearm and hand</td>
<td>Surgical</td>
<td>48</td>
<td>1. Bupivacaine + NS (24)</td>
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<td>2. Bupivacaine + Dex (24)</td>
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<td>Karthik 2015</td>
<td>Forearm and hand</td>
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<td>100</td>
<td>1. LevoBupivacaine + NS (50)</td>
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<td>2. LevoBupivacaine + Dex (50)</td>
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<td>Kaygusuz 2012</td>
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<td>Surgical</td>
<td>60</td>
<td>1. LevoBupivacaine + NS (30)</td>
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<td>2. LevoBupivacaine + Dex (30)</td>
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<td>Lee 2016</td>
<td>Forearm and hand</td>
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<td>51</td>
<td>1. Ropivacaine + NS (17)</td>
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<td>2. Ropivacaine + Dex (17)</td>
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<td>3. Ropivacaine + dexamethasone 10 mg (17)</td>
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<td>Zhang 2014</td>
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<td>Surgical</td>
<td>45</td>
<td>1. Ropivacaine + NS (15)</td>
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<td>2. Ropivacaine + Dex 50 µg (15)</td>
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<td>3. Ropivacaine + Dex 100 µg (15)</td>
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Vorobeichik et al. BJA. 2017;118:167-181
<table>
<thead>
<tr>
<th>Time-to-event outcomes</th>
<th>Number of studies included</th>
<th>Dex N</th>
<th>Dex Mean</th>
<th>Control N</th>
<th>Control Mean</th>
<th>Ratio of Means [95% Confidence Interval]</th>
<th>P-Value for statistical significance</th>
<th>P-Value for heterogeneity</th>
<th>Quality of evidence (GRADE)</th>
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<tr>
<td>Sensory block onset (min)</td>
<td>31</td>
<td>953</td>
<td>10.8</td>
<td>909</td>
<td>20.0</td>
<td>0.7 [0.6, 0.8]</td>
<td>&lt; 0.00001</td>
<td>&lt; 0.00001</td>
<td>★★★☆, Moderate</td>
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<td>Sensory block duration (min)</td>
<td>32</td>
<td>970</td>
<td>691.8</td>
<td>924</td>
<td>460.6</td>
<td>1.7 [1.6, 1.7]</td>
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<tr>
<td>Motor block onset (min)</td>
<td>27</td>
<td>860</td>
<td>13.4</td>
<td>815</td>
<td>21.2</td>
<td>0.7 [0.6, 0.9]</td>
<td>&lt; 0.00001</td>
<td>&lt; 0.00001</td>
<td>★★★☆, Moderate</td>
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<tr>
<td>Motor block duration (min)</td>
<td>31</td>
<td>957</td>
<td>605.9</td>
<td>909</td>
<td>412.9</td>
<td>1.7 [1.6, 1.8]</td>
<td>&lt; 0.00001</td>
<td>&lt; 0.00001</td>
<td>★★★★, High</td>
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<tr>
<td>Duration of analgesia (min)</td>
<td>26</td>
<td>787</td>
<td>716.5</td>
<td>754</td>
<td>452.4</td>
<td>1.7 [1.6, 1.8]</td>
<td>&lt; 0.00001</td>
<td>&lt; 0.00001</td>
<td>★★★☆, Moderate</td>
</tr>
</tbody>
</table>

Sensory block onset 20min->10min, duration 460min->691min  Motor block onset 21->13min, duration 412->605min
Sensory / Motor block duration for each block type

- Interscalene: block prolonged at least 44% & 26% (sensory / motor)
- Supraclavicular: block prolonged at least 54% & 61%
- Infraclavicular: block prolonged at least 21% & 19%
- Axillary: block prolonged at least 34% & 11%

- Overall sensory prolonged by at least 57% (7.7h -> 11.5h), motor by at least 58% (6.9h -> 10.1h)
“Our additional subgroup analysis suggested that a dose of 50-60ug maximizes sensory block duration while minimizing the hemodynamic side-effects to none”

Note also that quality of evidence is “very low” for the sedation analysis

Vorobeichik et al. BJA. 2017;118:167-181
Summary

• Based on 34 RCTs, perineural dexmedetomidine as an adjunct for BP blocks:
  • Prolongs sensory and motor block durations
  • Reduces onset of sensory and motor blocks
  • Prolongs duration of analgesia
  • Reduces cumulative 24h postop analgesic consumption (morphine equiv)
  • Improves pain control and patient satisfaction scores

• Increases risk of transient hypotension, bradycardia, and sedation

• Considerations
  • No subgroup analysis of adverse effects for type of BP block

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Applicable to our practice?

• Perhaps consider a 50ug dose, for patients who can tolerate relative hypotension / bradycardia, with goal to extend sensory block duration by approx. 4 hrs. However, motor block will be prolonged too.

• Not a good preop block for patients with surgeries in sitting position

• The 2 lower extremity block studies did not show bradycardia
Bradycardia and Hypotension?

**Effect of perineural dexmedetomidine on the quality of supraclavicular brachial plexus block with 0.5% ropivacaine and its interaction with general anaesthesia**

Indira Gurajala, Anil Kumar Thippampall, Padmaja Durga, and R Gopinath

36 patients total. 18 received 0.5% ropiv only for block, 18 received ropiv + 50ug dexmedetomidine
2 patients in each group had HR < 50

3 patients in dex group had transient hypotension (fall in SBP of 20%)

Gurajala et al. Indian J Anaesth. 2015;59:89-95
Results fairly similar to the previous meta-analysis for BP blocks, but this one found bradycardia and no hypotension.
Results: Eighteen randomized controlled trials were included in this meta-analysis (n = 1092 patients). The addition of dexmedetomidine significantly reduced sensory block time onset time by 3.19 minutes (95% confidence interval [CI], -4.60 to -1.78 minutes; $I^2 = 95\%$; $P < 0.00001$), prolonged sensory block duration by 261.41 minutes (95% CI, 145.20–377.61 minutes; $I^2 = 100\%$; $P < 0.0001$), reduced the onset of motor blockade by 2.92 minutes (95% CI, -4.37 to -1.46 minutes; $I^2 = 96\%$, $P < 0.0001$), and prolonged motor block duration by 200.90 minutes (CI, 99.24–302.56 minutes; $I^2 = 99\%$; $P = 0.0001$) as compared with control. Dexmedetomidine also significantly prolonged the duration of analgesia by 289.31 minutes (95% CI, 185.97–392.64 minutes; $I^2 = 99\%$; $P < 0.00001$). Significantly more patients experienced intraoperative bradycardia with dexmedetomidine (risk difference [RD], 0.06; 95% CI, 0.00–0.11; $I^2 = 72\%$; $P = 0.03$); however, there was no difference in the incidence of intraoperative hypotension (RD, 0.01; 95% CI, -0.02 to 0.04; $I^2 = 3\%$; $P = 0.45$). It is important to note that all studies reported that intraoperative bradycardia was either transient in nature or reversible, when needed, with the administration of intravenous atropine.
Perineural Dexmedetomidine Is More Effective Than Clonidine When Added to Local Anesthetic for Supraclavicular Brachial Plexus Block: A Systematic Review and Meta-analysis

Kariem El-Boghdady, MBBS, FRCA,*† Richard Brull, MD, FRCPC,*‡ Herman Sehmbi, MD,*† and Faraj W. Abdallah, MD*§

BACKGROUND: Clonidine, an \( \alpha \)-2 agonist, has long been used as a local anesthetic adjunct with proven efficacy to prolong peripheral nerve block duration. Dexmedetomidine, a newer \( \alpha \)-2 agonist, has a more favorable pharmacodynamic and safety profile; however, data comparing its efficacy as an adjunct to that of clonidine are inconsistent. We sought to compare the clinical efficacy of these 2 \( \alpha \)-2 agonists by examining their effects on peripheral nerve block characteristics for upper extremity surgery.
BACKGROUND: Clonidine, an α-2 agonist, has long been used as a local anesthetic adjunct with proven efficacy to prolong peripheral nerve block duration. Dexmedetomidine, a newer α-2 agonist, has a more favorable pharmacodynamic and safety profile; however, data comparing its efficacy as an adjunct to that of clonidine are inconsistent. We sought to compare the clinical efficacy of these 2 α-2 agonists by examining their effects on peripheral nerve block characteristics for upper extremity surgery.

METHODS: A preliminary search found that the overwhelming majority of randomized controlled trials comparing perineural dexmedetomidine to clonidine for upper extremity surgery were in the setting of supraclavicular brachial plexus block (SCB). Therefore, we performed a systematic review and meta-analysis of randomized controlled trials comparing dexmedetomidine with clonidine as perineural adjuncts to single-injection SCB. Sensory and motor block duration and onset, analgesic duration, α-2 agonist side effects, and block complications were analyzed. Sensory block duration was designated as a primary outcome. Data were combined using random-effects modeling, and ratio-of-means was used to analyze the results.

RESULTS: A total of 868 patients from 14 clinical studies were included in the analysis. Compared with clonidine, dexmedetomidine prolonged the duration (ratio of means [95% confidence interval {CI}]) of sensory block by an estimate of 1.2 (1.2–1.3; P < .00001). It also prolonged the duration (ratio of means [99% CI]) of motor block by an estimate of 1.2 (1.1–1.3; P < .00001), and analgesia by an estimate of 1.2 (1.1–1.3; P < .00001). It also hastened the onset of sensory block by an estimate of 0.9 (0.8–1.0; P < .00001) and motor block by an estimate of 0.9 (0.9–1.0; P = .002). Dexmedetomidine was associated with an increased odds ratio (99% CI) of transient bradycardia by an estimate of 7.4 (1.3–40.8; P = .003) and postoperative sedation by an estimate of 11.8 (1.9–73.6; P = .0005). There were no differences in other α-2 agonist–related side effects or block-related complications.

CONCLUSIONS: Compared with clonidine as a local anesthetic adjunct for single-injection SCB, perineural dexmedetomidine enhances sensory, motor, and analgesic block characteristics. These benefits should be weighed against the increased risk of transient bradycardia.

Take Home Points

• Prolongs sensory and motor blocks by 3-4 hours
• Reduces onset time by a few minutes
• More brachial plexus studies so far than lower extremity blocks
• 50ug dose seems to offer benefit without significantly increasing risk of bradycardia & hypotension (based on 1 meta-analysis, and 1 dose-comparison study for lower extremity block)