Peripheral Nerve Blocks in Pediatric Orthopedic Patients: Are There Any Post Recovery Benefits? – A Prospective Randomized Study

M. Sathyamoorthy, MD; L. Haber, MD; P. Wright, MD; G. Wilson; M. Ryals, CRNA; Anna Fumiss MS; E. Womack, PhD; and D. Maposa, MD

University of Mississippi Medical Center, Jackson, MS

Background
- The benefits of single-shot peripheral nerve blocks (PNBs) are limited by duration of action of the local anesthetic used in the block.
- The orthopedic surgeons at our hospital observed that patients who received nerve blocks used less opioids at home as compared to those who did not get any block.

Objective
- To determine if single shot PNBs decrease oral hydrocodone usage at home up to 7 days in the post-operative period.
- To determine if it improves parents’ satisfaction with post-operative pain management.

Methods
- Local IRB approval was obtained and the study was registered at clinicaltrials.gov (NCT02236130).
- Children between the ages of 6 and 17 years who underwent ambulatory orthopedic surgery associated with moderate to severe postoperative pain were included in the study.
- Fifty-two patients were randomly assigned to one of two groups: general anesthesia only (GA group) or GA combined with regional anesthesia (RA group).
- Patients in the RA group received a PNB done by the attending anesthesiologist under ultrasound guidance (Sonosite) using 0.5% ropivacaine up to a total dose of 3mg/kg.
- Anesthesia was maintained in both groups with O2/Sevoflurane titrated to MAC of 1.5. After surgical incision, doses of 0.05mg/kg intravenous morphine was titrated every 5 minutes as needed to keep heart rate and blood pressure within 10% of baseline.
- A standard prescription of Lorabant hydrocodone 5mg with acetaminophen 325mg was given to all patients, and they were instructed to take 1-2 pills every 4 to 6 hours as needed for pain (VAS >2).
- The parents were educated about assessing pain and instructed to complete a pain diary documenting the VAS pain score, number of pills used each day, side-effects and return it by mail.
- A research nurse blinded to the groups did a follow-up phone call asking the same study data questions as in pain diary filled out by parents on post-operative days 2 and 8.
- The non-parametric Kruskal-Wallis rank test was used to compare differences in continuous measures, while the Chi-square test of proportions was used for categorical data. All analyses were done using STATA 14.0.

Results
- Patient allocation and study data analyzed shown in Figure 1
- There was no significant difference in total cumulative hydrocodone use between the groups both on Day 2 and Day 8 (Figure 2). Patients in RA group had lower pain scores on POD 0. The pain scores fell below 4 after POD 2 in both groups (Figure 3).
- Both groups had similar satisfaction with post-operative pain control (Figure 4)
- Patients in RA group received significantly lower morphine both intra-op and in PACU. (Table 2).

Conclusion
- In this study, we found that single-shot PNBs in pediatric orthopedic surgery do not seem to provide additional benefit in reducing hydrocodone consumption beyond the duration of the block or improve parents’ satisfaction with pain control.
- The number of missing data due to lost patient follow up is a significant limitation of this study.

Table 1. Demographics

<table>
<thead>
<tr>
<th>Measures</th>
<th>Control (GA) (n=22)</th>
<th>Treatment (RA) (n=27)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years), mean (SD)</td>
<td>10.35 (2.40)</td>
<td>11.41 (2.50)</td>
<td>0.312</td>
</tr>
<tr>
<td>Male/Female, n</td>
<td>16/6</td>
<td>16/11</td>
<td>0.033</td>
</tr>
<tr>
<td>Weight (kg), mean (SD)</td>
<td>52.72 (29.20)</td>
<td>51.35 (18.54)</td>
<td>0.827</td>
</tr>
<tr>
<td>Anesthesia time (min), mean (SD)</td>
<td>56.45 (82.12, 110.78)</td>
<td>118.64 (103.54, 133.34)</td>
<td>0.046</td>
</tr>
<tr>
<td>Surgery time (min), mean (SD)</td>
<td>58.41 (40.73, 73.09)</td>
<td>73.64 (60.21, 90.67)</td>
<td>0.158</td>
</tr>
</tbody>
</table>

Table 2. Study Outcome Data

<table>
<thead>
<tr>
<th>Measures</th>
<th>Control (GA) (n=22)</th>
<th>Treatment (RA) (n=27)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine dose intraop (mg/kg), mean (CI)</td>
<td>0.14 (0.12, 0.16)</td>
<td>0.23 (0.01, 0.05)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Morphine dose in PACU (mg/kg), mean (CI)</td>
<td>0.03 (0.01, 0.05)</td>
<td>0.01 (0.01, 0.01)</td>
<td>0.002</td>
</tr>
<tr>
<td>Readministered morphine in PACU, n (%)</td>
<td>13 (35%)</td>
<td>5 (15%)</td>
<td>0.053</td>
</tr>
<tr>
<td>Time to discharge ready (min), mean (SD)</td>
<td>341.5 (111.0, 171.9)</td>
<td>124.7 (102.1, 147.3)</td>
<td>0.407</td>
</tr>
</tbody>
</table>

Figure 1. CONSORT Flow Chart.

Figure 2. Cumulative hydrocodone usage on postoperative day 2 and day 8.

Figure 3. VAS Pain Scores for both groups over seven days post-surgery. Median and Inter-Quantile range of pain scores presented in the graph.

Figure 4. Parents’ satisfaction with pain control post surgery at home.