Declaration of interest

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Continuous perineural infusion after lower extremity osteotomies in children: a feasibility and safety analysis

Editor—We wish to report our experience using continuous perineural infusions (CPNI) for postoperative analgesia in a paediatric population undergoing elective lower extremity osteotomies. While the use and safety of regional anaesthesia during postoperative care of paediatric patients undergoing orthopaedic surgery has been reported,1 2 placement of CPNI in children undergoing elective osteotomies of the lower extremity, which may have a higher postoperative risk for acute compartment syndrome (ACS), remains controversial.

After obtaining IRB approval, we reviewed our regional anaesthesia database and identified patients who had a CPNI placed as part of their care for lower extremity osteotomy. From March 2003 to February 2011, 222 patients had a total of 343 peripheral nerve blocks (PNBs) performed for postoperative pain management after lower extremity osteotomies. The mean (range) age was 12.9 (3–18) yr. Of the 343 blocks performed, 82 were single-shot nerve blocks (SS) and 261 were CPNI. Figure 1 provides a breakdown of the type and location of the blocks performed. Surgical characteristics of the patients revealed that 47% (105/222) had osteotomies of the foot, ankle, or both, while 53% of patients (117/222) underwent long-bone osteotomy (femoral, tibial, or tibial/fibular osteotomy) for deformity correction. Block failure was recorded in 14 children (6%) with the absence of sensory block in eight patients and catheter dislodgement in six patients. Despite our use of dilute local anaesthetics (typically 0.1–0.2% ropivacaine or 0.125–0.25% bupivacaine), we had a 22% incidence of motor block (74/343 blocks). Sciatic nerve block (90%) represented the majority of motor blocks observed. All patients were followed acutely by the orthopaedic and pain service until catheter removal and block resolution, and then long term in the orthopaedic clinic. We did not identify any episodes of missed or delayed ACS, nerve injury, persistent numbness, or paraesthesia during follow-up.

Foot, ankle, and lower extremity long-bone osteotomies for deformity correction are common orthopaedic procedures in children and adolescents. While the use of regional anaesthesia is an attractive idea, this population may be at increased risk of postoperative compartment syndrome. There have been a number of case reports of compartment syndrome in the setting of neuraxial anaesthesia3 and CPNI4 which may give paediatric anaesthesiologists and orthopaedic surgeons reason to pause when considering whether or not to utilize regional anaesthesia in these surgical populations. Review of our experience caring for patients undergoing lower extremity osteotomies with regional anaesthesia reveals a high success rate (94%) and a low complication rate. While actual invasive measurements of compartment pressures were not performed, none of the patients in our series revealed any postoperative symptoms of increased compartment pressures that warranted needle measurement of pressures.

In addition to the limitations inherent to retrospective studies, we provide no actual documentation of objective compartment pressures in any of the patients. However, given the absence of any clinical signs of increased compartment pressure after operation, the actual needle measurement of pressures in this cohort of children purely for research purposes was unacceptable. Additionally, even with 222 patients in this study, it is likely that the incidence of adverse events could have been underestimated due to their rarity. Despite these limitations, our data demonstrate...
the feasibility of implementing and managing a regional anesthesia programme utilizing CPNI for postoperative management of lower extremity osteotomies for correction of congenital or acquired limb abnormalities in children. In this sample of patients, the use of CPNI for pain management appeared to be safe and well tolerated. There were no cases of compartment syndrome or irreversible sensory or motor loss in our patient population.

Declaration of interest

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Real-time thoracic paravertebral block using an ultrasound-guided positioning system

Editor—Ultrasound-guided thoracic paravertebral block (TPVB) is well described.1, 2 The depth of the paravertebral space, the probe position, and the acute angle of needle trajectory renders the tip and distal portion of the needle difficult to visualize while concurrently viewing the anatomical structures using conventional ultrasound techniques. Recently, we have had an opportunity to evaluate a novel ultrasound machine with an electromagnetic-based needle guidance system for the placement of TPVB. The SonixGPS™ needle guidance system (Ultrasonix, Richmond, BC, Canada) uses sensors in the needle and transducer to provide a real-time display of needle shaft and tip position relative to the ultrasound beam based on the needle trajectory.

After institutional ethics approval and written informed consent, a convenience sample of 10 ASA I–III patients undergoing percutaneous nephrolithotomy (PCNL) was recruited for lower TPVB. All TPVBs were placed under general anaesthesia (propofol, neuromuscular blocking agent, desflurane) with the patients prone, in keeping with our standard practice. The lower thoracic region was prepared, and the paravertebral spaces of T10, T11, and T12 were identified sonographically. Once the paravertebral spaces were identified, five patients received real-time in-plane TPVB at each level, and the other five patients received real-time out-of-plane TPVB using a 2–5 MHz convex transducer (Ultrasonix) and 8 cm 19 G SonixGPS™ needles (Ultrasonix). At each level, the transverse process, the paravertebral space, the lamina, and the superior costotransverse ligament were identified sonographically. Once the paravertebral spaces were chosen, five patients received real-time in-plane TPVB at each level, and the other five patients received real-time out-of-plane TPVB using a 2–5 MHz convex transducer (Ultrasonix) and 8 cm 19 G SonixGPS™ needles (Ultrasonix). At each level, the transverse process, the paravertebral space, the lamina, and the superior costotransverse ligament were identified on scanning laterally to locate the ribs. The ultrasound probe was positioned parasagittally while the needle was directed via an in-plane (caudad to cephalad) or out-of-plane (lateral to medial) approach using the needle guidance system to the paravertebral space. Once the needle tip was in the paravertebral space, 5 ml of 0.5% ropivacaine was

Table 1 Patient characteristics, block approach, time to perform block, and sensory level for TPVB block in 10 patients. OOP, out of plane; IP, in-plane

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age (yr)</th>
<th>Sex</th>
<th>Height (cm)</th>
<th>Weight (kg)</th>
<th>Approach</th>
<th>Block time (min)</th>
<th>Dermatome blocked</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>52</td>
<td>M</td>
<td>178</td>
<td>96</td>
<td>OOP</td>
<td>10</td>
<td>T9–11</td>
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<td>2</td>
<td>66</td>
<td>F</td>
<td>183</td>
<td>100</td>
<td>OOP</td>
<td>10</td>
<td>T8–12</td>
</tr>
<tr>
<td>3</td>
<td>48</td>
<td>M</td>
<td>165</td>
<td>86</td>
<td>OOP</td>
<td>15</td>
<td>T10–11</td>
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<tr>
<td>4</td>
<td>54</td>
<td>F</td>
<td>152</td>
<td>77</td>
<td>OOP</td>
<td>15</td>
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<tr>
<td>5</td>
<td>64</td>
<td>M</td>
<td>174</td>
<td>113</td>
<td>IP</td>
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<td>T10–11</td>
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<tr>
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<td>57</td>
<td>M</td>
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<td>108</td>
<td>IP</td>
<td>10</td>
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</tr>
<tr>
<td>7</td>
<td>67</td>
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<td>151</td>
<td>110</td>
<td>IP</td>
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<td>Block failed</td>
</tr>
<tr>
<td>8</td>
<td>46</td>
<td>F</td>
<td>167</td>
<td>78</td>
<td>IP</td>
<td>15</td>
<td>T8–12</td>
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<td>162</td>
<td>48</td>
<td>IP</td>
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</tr>
<tr>
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<td>180</td>
<td>86</td>
<td>OOP</td>
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<td>T12–L1</td>
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