Bilateral sensory and motor aspects of hand function in individuals with childhood-onset hemidystonia

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BACKGROUND

- Perinatal stroke is one etiology of cerebral palsy (CP)1. In this sub-population, childhood-onset hemidystonia is a disabling outcome without effective treatments2.
- Coexistence of dystonia with spasticity2 complicates the diagnosis of dystonia. Research and treatment efforts targeting dystonia are therefore limited.
- In addition to known motor control deficits, sensory dysfunction has been associated with dystonia of various etiologies3,4. However, the functional consequences of motor and sensory deficits of childhood-onset hemidystonia are poorly understood.

OBJECTIVES

1. To assess bilateral motor performance and tactile sensation in individuals with hemidystonia due to unilateral perinatal stroke.
2. To relate sensory responses and motor outcomes and to relate these to the severity of dystonia.

METHODS

Participants included 7 individuals with wrist hemidystonia (DYS), as identified with the Hypermotor Assessment Tool (HAT) and 9 healthy volunteers (HV). Table 1: Subject Characteristics. The DYS group has higher BFM scores than HV group on the non-dominant side (Mann-Whitney U-test, p < 0.001).

<table>
<thead>
<tr>
<th>Subject</th>
<th>Group</th>
<th>Sex</th>
<th>Age (yrs)</th>
<th>Ectomy</th>
<th>MACS</th>
<th>BFM scores</th>
<th>Affect joints</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>DYS</td>
<td>M</td>
<td>8.1</td>
<td>Left MCA stroke</td>
<td>II</td>
<td>D: 2; ND: 9</td>
<td>s, o, w, f</td>
</tr>
<tr>
<td>2</td>
<td>DYS</td>
<td>F</td>
<td>11.2</td>
<td>Left MCA stroke</td>
<td>I</td>
<td>D: 1; ND: 12</td>
<td>s, w, f</td>
</tr>
<tr>
<td>3</td>
<td>DYS</td>
<td>M</td>
<td>13.6</td>
<td>Left MCA stroke</td>
<td>II</td>
<td>D: 3; ND: 16</td>
<td>o, w, f</td>
</tr>
<tr>
<td>4</td>
<td>DYS</td>
<td>F</td>
<td>16.8</td>
<td>Left MCA stroke</td>
<td>II</td>
<td>D: 3; ND: 9</td>
<td>o, w, f</td>
</tr>
<tr>
<td>5</td>
<td>DYS</td>
<td>M</td>
<td>17.1</td>
<td>ACA stroke</td>
<td>I</td>
<td>D: 1; ND: 16</td>
<td>s, o, w, f</td>
</tr>
<tr>
<td>6</td>
<td>DYS</td>
<td>M</td>
<td>19.1</td>
<td>Left MCA stroke</td>
<td>II</td>
<td>D: 2; ND: 12</td>
<td>s, w, f</td>
</tr>
<tr>
<td>7</td>
<td>DYS</td>
<td>M</td>
<td>19.3</td>
<td>Left MCA stroke</td>
<td>II</td>
<td>D: 2; ND: 12</td>
<td>s, w, f</td>
</tr>
<tr>
<td>-</td>
<td>HV</td>
<td>BF</td>
<td>17 ± 5</td>
<td></td>
<td></td>
<td>D: 10.6; ND: 10.7</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>HV</td>
<td>1M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

Legend: *= associated spasticity; M: Male; F: Female; MCA: Middle cerebral artery; ACA: Anterior cerebral artery; MACS: The manual ability classification system = shoulder, o = elbow, w = wrist; BFM: Burke-Fahn-Marsden dystonia rating scale; arm score D: Dominant side; ND: Non-dominant side

RESULTS

A. Motor outcomes (Fig. 1)

1. Reach time: from movement start to grasp
2. Hold time: from grasp to lift
3. Shoulder/Elbow correlation: Pearson’s correlation between shoulder flexion/elbow extension trajectories
4. Hand orientation error: difference in hand vector (Fig. 2) at grasp in each with DYS from mean of HV

B. Sensory outcomes (Fig. 2)

1. Spatial Discrimination Threshold (SDT): groove spacing (Fig. 3) with 75% correct responses of groove orientation on fingertip
2. Temporal Discrimination Threshold (TDT): minimum time between 2 painless electrical pulses required to perceive both.
3. Stereognosis: 4 items (pen, pencil, key, coin, paper clip, bolt, cotton ball, rubber band) correctly identified by touch

CONCLUSIONS

- Reorganization after early brain injury
- Impact of dystonia severity on hand function

REFERENCES


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