Effect of chemodenervation and serial casting on gait parameters in acquired brain injury patients with upper extremity spasticity.

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Objective
Following stroke and acquired brain injuries (ABI), patients may develop abnormal hemiplegic gait patterns. These gait patterns create overuse injuries, are unstable and inefficient.

A case series to prospectively investigate the changes in temporospatial and kinematic gait parameters in 20 hemiplegic patients treated for upper limb elbow flexor pattern spasticity with botulinum toxin-A chemodenervation and adjunctive therapy involving serial casting.

This study is intended to guide future research.

Hypothesis
The combined intervention of botulinum toxin A chemodenervation & casting will affect improvements in gait parameters of ABI patients

Methods
Case series of 8 Stroke, 1 TBI patients underwent ultrasound guided Incobotulinum toxin type-A (Xeomin) injection to the Brachialis (100 units) and Brachioradialis (75 units) muscles.

Two weeks following the injections, patients received a single upper extremity stretching cast for a duration of seven days.

Outcome measures consisted of: Modified Ashworth Scale (MAS), Tardieu Spasticity Angle (TSA), maximum elbow extension range of motion (ROM), two minute walk test (2MWT), Edinburgh gait score (EGS) and a calculation of step length symmetry.

Outcomes were selected to quantify the changes in functional gait parameters and how they compare to upper extremity spasticity attributes.

Results

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Mean Improvement</th>
<th>Standard deviation of Improvement</th>
<th>Minimum Difference</th>
<th>Maximum Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAS</td>
<td>0.43</td>
<td>.45</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>EGS</td>
<td>1.9</td>
<td>3.3</td>
<td>-1</td>
<td>9</td>
</tr>
<tr>
<td>2MWT (M)*</td>
<td>5.7</td>
<td>7.1</td>
<td>1</td>
<td>21.5</td>
</tr>
<tr>
<td>TSA (Degrees)</td>
<td>15.9</td>
<td>11.9</td>
<td>2</td>
<td>32</td>
</tr>
<tr>
<td>Step Length %</td>
<td>1.9</td>
<td>2.9</td>
<td>-3</td>
<td>5.4</td>
</tr>
</tbody>
</table>

Pre-Intervention

<table>
<thead>
<tr>
<th>R1</th>
<th>R2</th>
<th>Cast Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>97°</td>
<td>137°</td>
<td>126°</td>
</tr>
</tbody>
</table>

9 of the desired 20 patients have been enrolled and all completed the protocol.

89% of patients displayed improvements on all outcome measures

>20 degree change in tardieu angle of the elbow corresponded with more notable improvements in EGS (Edinburgh Gait Score) and 2MWT (Two minute walk test) results.

EGS results show that common improvement categories were: toe clearance in swing, heel strike, line of progression during ambulation.

Limitations
This poster contains only preliminary data (9/20 patients)

Subset analysis is required to provide greater insight into differences in patient response to treatment.

2MWT took place on a 3 M walkway instead of a circular track; turn around times significantly affected walking distance.

Conclusions
There is a trend of improvement in gait parameters following injection and casting of the spastic upper hemiplegic limb

Casting is an important adjunctive therapy post botulinum toxin type-A treatment for focal spasticity of the upper limb

Future RCT required to determine causal effect between casting post botox and results; not just caused by botox alone.