Objective

This study compares the abilities of body-worn sensors and timed tests to objectively capture self-perceived gait and balance changes in people with MS.

Hypothesis

1. Body-worn sensors can reliably capture gait and balance parameters that distinguish MS from controls over 18 months.
2. The distinguishing parameters worsen in MS compared to controls over time.

Background

While gait and balance impairments are hallmarks of MS in both early and late disease, current stopwatch-timed measures are insensitive and poorly reproducible. Body worn sensors housing gyroscopes and accelerometers collect clinic-based objective gait and balance data. We previously demonstrated that these sensors can distinguish people with mild MS from healthy controls when standard timed tests like the Timed 25 Foot Walk (T25FW) cannot.(1)

Design/Methods

Design: longitudinal cohort
Subjects: Adult MS with normal T25FW of < 5 sec at entry. Age & sex-matched controls. Measures: T25FW and the walking and standing tests while wearing body-worn sensors were repeated at 6 month intervals for MS and at the beginning and 18 month time-point for control subjects.
Statistical analysis: Linear mixed model to detect group differences and interaction.

Results

Table 1. Demographics, baseline characteristics

<table>
<thead>
<tr>
<th></th>
<th>MS</th>
<th>CONTROLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Age (range)</td>
<td>39.8 (17-67)</td>
<td>37.0 (26-60)</td>
</tr>
<tr>
<td>% Female</td>
<td>62</td>
<td>67</td>
</tr>
<tr>
<td>Duration MS</td>
<td>7.9 (2-31)</td>
<td>NA</td>
</tr>
<tr>
<td>Self-rated DSS (0-10)</td>
<td>3.0 (0-5)</td>
<td>0.0</td>
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</tbody>
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Table 2. Parameters distinguishing MS from controls; p value. More quiet stance parameters (light blue) than gait parameters (dark blue) consistently distinguished MS from controls (red).

Discussion

• Body-worn sensors consistently detect differences in gait and balance parameters between MS subjects and controls while standard timed tests cannot.
• Most distinguishing parameters occur during the sway task and relate to balance control.
• While no parameter worsened over time, a subgroup appeared to worsen while another subgroup improved. Further analysis will determine the significance of these subgroups.

Instrumented mobility measures have the potential to:
• Improve efficiency of clinical trials by reducing subject numbers and costs;
• Improve clinical decision-making by detecting early and clinically relevant functional declines.

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