Introduction

Magnetization transfer (MT) imaging is sensitive to the most destructive aspects of multiple sclerosis (MS) and MT ratio (MTR) histogram analysis may provide accurate estimates of the overall (macro- and microscopic) disease burden in the brain and cervical cord (1, 2). However, the correlations between brain and cord white matter pathology and the relative contributions of brain and cervical cord damage to the development of irreversible neurological disability in MS are still unclear. The aims of this study were: a) to evaluate the amount of the macro- and microscopic damage in the brain and cervical cord from patients with MS and different clinical phenotypes, b) to investigate the correlations between MTR histogram measures derived from the two regions and c) to assess the value of MTR histogram parameters obtained from the two regions for predicting the presence and extent of MS clinical disability.

Materials and methods

We studied seventy-seven MS patients (43 women, 34 men; 40 with a relapsing-remitting [RR], 28 with a secondary progressive [SP] and 9 with a primary progressive [PP] disease course) (3). Mean patients' age was 37.5 years (SD: 9.3 years), mean disease duration was 8.6 years (SD: 7.0 years), median EDSS score was 3.0 (range: 0.0-7.5). A 1.5 T scanner was used to acquire the following sequences for the brain: dual-echo turbo spine-echo (TR=3300, TE=16/98, ETL=5), T1-weighted conventional spin-echo (TR=TE=768/14) and 2D gradient echo (GE) (TR=TE=600/12) with and without a MT saturation pulse. For all the acquisitions, two observers by agreement. Brain and cervical cord MTR histograms were obtained from all patients, following a method previously described (1, 2). For each histogram, the relative peak height, the peak position and the average MTR were calculated.

Results

Brain and cervical cord MRI measures and MTR histogram parameters are well correlated with MS severity. The lack of significant correlations between most of the histogram metrics derived from the brain and the cord suggests that MTI studies of the two regions might provide complementary information for monitoring MS evolution.

Conclusions

Our data confirm that brain and cervical cord MTR histogram-derived measures are well correlated with MS severity. The lack of significant correlations between most of the histogram metrics derived from the brain and the cord suggests that MTI studies of the two regions might provide complementary information for monitoring MS evolution.

References


Table.

<table>
<thead>
<tr>
<th></th>
<th>All MS</th>
<th>RRMS</th>
<th>SPMS</th>
<th>PPMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brain T2</td>
<td>13.5</td>
<td>11.4</td>
<td>22.2</td>
<td>8.0</td>
</tr>
<tr>
<td>(ml)</td>
<td>(15.5)</td>
<td>(9.1)</td>
<td>(20.8)</td>
<td>(5.9)</td>
</tr>
<tr>
<td>T1 (ml)</td>
<td>5.5</td>
<td>4.4</td>
<td>6.4</td>
<td>0.9</td>
</tr>
<tr>
<td>(TR=TE=60/12)</td>
<td>(5.1)</td>
<td>(3.3)</td>
<td>(3.9)</td>
<td>(0.7)</td>
</tr>
<tr>
<td>Brain MTR (%)</td>
<td>39.2</td>
<td>39.4</td>
<td>38.7</td>
<td>39.7</td>
</tr>
<tr>
<td>Height (14.9)</td>
<td>(1.3)</td>
<td>(1.6)</td>
<td>(1.0)</td>
<td>(0.6)</td>
</tr>
<tr>
<td>Brain peak</td>
<td>103.8</td>
<td>106.0</td>
<td>100.0</td>
<td>105.9</td>
</tr>
<tr>
<td>position (%)</td>
<td>34.4</td>
<td>34.6</td>
<td>33.6</td>
<td>35.4</td>
</tr>
<tr>
<td>Number of</td>
<td>2.0</td>
<td>1.6</td>
<td>2.8</td>
<td>1.5</td>
</tr>
<tr>
<td>cord lesions</td>
<td>(1.4)</td>
<td>(1.3)</td>
<td>(1.3)</td>
<td>(1.0)</td>
</tr>
<tr>
<td>Cord MTR (%)</td>
<td>44.4</td>
<td>44.9</td>
<td>43.8</td>
<td>43.7</td>
</tr>
<tr>
<td>(2.4)</td>
<td>(2.3)</td>
<td>(2.5)</td>
<td>(1.5)</td>
<td></td>
</tr>
<tr>
<td>Cord peak</td>
<td>63.9</td>
<td>66.5</td>
<td>60.9</td>
<td>61.8</td>
</tr>
<tr>
<td>height (15.2)</td>
<td>(17.5)</td>
<td>(11.1)</td>
<td>(13.1)</td>
<td></td>
</tr>
<tr>
<td>Cord position</td>
<td>39.1</td>
<td>40.2</td>
<td>38.1</td>
<td>37.3</td>
</tr>
<tr>
<td>(%)</td>
<td>(3.4)</td>
<td>(3.1)</td>
<td>(3.3)</td>
<td>(4.0)</td>
</tr>
</tbody>
</table>

Data are expressed as mean values (SD).