FEASIBILITY OF SAGITTAL T2 MAPPING OF HUMAN MEDIAN NERVE FOR LOCALIZATION OF ABNORMAL REGION IN PATIENTS WITH CARPAL TUNNEL SYNDROME


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Introduction
The diagnosis of carpal tunnel syndrome (CTS) has been generally based on clinical features and electrophysiological data, however, localization of entrapment point in the median nerve and quantification in severity of the disease were difficult. Recent advanced MRI technology with use of dedicated microscopy coils has provided high-resolutional axial images of the wrist, and allowed quantification of CTS regarding signal intensity, thickness and cross-sectional area of the median nerve[1,2], and bowing of the flexor retinaclum [3]. Although some relationships between those measurements and clinical symptom were shown in previous studies, accurate detection of abnormal region along the median never was still difficult.

T2 measurement of water proton has potential for quantitative evaluation of neuropathy due to its high sensitivity of change in fluid dynamics and water content in the endoneurial compartment. We evaluated patients with CTS using T2 mapping of the median nerve at 3Tesla. Sagittal images of the median nerve were employed to improve detection of localized abnormal region, as compared with adjacent normal nerve region.

Materials & Methods
Three patients with CTS (all women, aged 35, 50 and 80 years) and one female healthy volunteer (28 years) were studied in a new reports regarding localization of most abnormal T2 region in the median nerve were still difficult.

Methods

<table>
<thead>
<tr>
<th>Case</th>
<th>Age/sex</th>
<th>Clinical diagnosis</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>ROI 1</th>
<th>ROI 2</th>
<th>ROI 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>27/F</td>
<td>Normal volunteer</td>
<td>2.1</td>
<td>1.9</td>
<td>1.6</td>
<td>1.05</td>
<td>1.03</td>
<td>1.11</td>
</tr>
<tr>
<td>2</td>
<td>35/F</td>
<td>CTS</td>
<td>2.2</td>
<td>2.2</td>
<td>1.9</td>
<td>1.46</td>
<td>1.13</td>
<td>1.49</td>
</tr>
<tr>
<td>3</td>
<td>50/F</td>
<td>CTS</td>
<td>2.2</td>
<td>2.2</td>
<td>2.1</td>
<td>1.02</td>
<td>1.2</td>
<td>1.15</td>
</tr>
<tr>
<td>4</td>
<td>80/F</td>
<td>CTS</td>
<td>2.3</td>
<td>2.1</td>
<td>2.4</td>
<td>1.09</td>
<td>1.24</td>
<td>1.19</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>ROI 1</th>
<th>ROI 2</th>
<th>ROI 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flattening ratio</td>
<td>T2 ratio</td>
<td>Flattening ratio</td>
<td>T2 ratio</td>
<td>Flattening ratio</td>
<td>T2 ratio</td>
</tr>
</tbody>
</table>

ROI 1 to ROI 3: in the carpal tunnel area with equal length.
ROI-C (control ROI): distal to the carpal tunnel.
L1: Level of distal edge of carpal tunnel.
L2: Level of middle of carpal tunnel.
L3: Level of proximal edge of carpal tunnel.

Discussion

In conclusion, sagittal T2 mapping of the median nerve was feasible for identifying abnormal T2 region of the median nerve, presumably relating with nerve damage (swelling, edema, or disturbance of nerve fiber arrangements).

References


Tables

Table 1: Subject’s profiles

Table 2: ROI-C with equal length.

Fig 1: Median nerve at sagittal MR image (black arrows)

Fig 2: Definition ROIs and the level of axial images.

Fig 3: T2 mapping of the median nerve. Low T2 value is represented by blue color and high T2 value is represented by red color.

A: healthy volunteer (Case 1). Constant T2 value
B: Patient with CTS (Case 2). High T2 ratio at ROI 1
C: Patient with CTS (Case 3). High T2 ratio at ROI 2
D: Patient with CTS (Case 3). High T2 ratio at ROI 2