**Supplementary Material**

**Supplementary Method 1**

We used -1.0 SD instead of -1.5 SD, to define the objective memory decline in patients with amnestic mild cognitive impairment (aMCI). From 2007, it has published several papers in international journals using the same criteria for aMCI [1-18].

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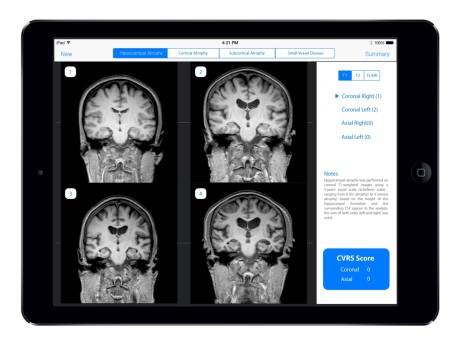
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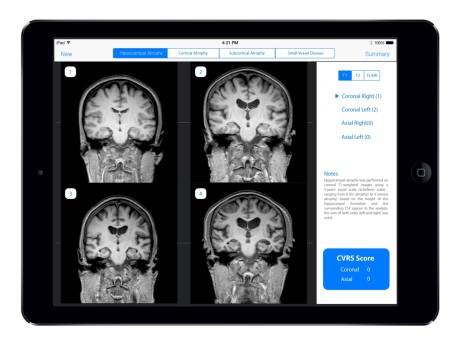
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**Supplementary Figure 1.** The Comprehensive Visual Rating Scale (CVRS) on a tablet computer (the iPAD version).

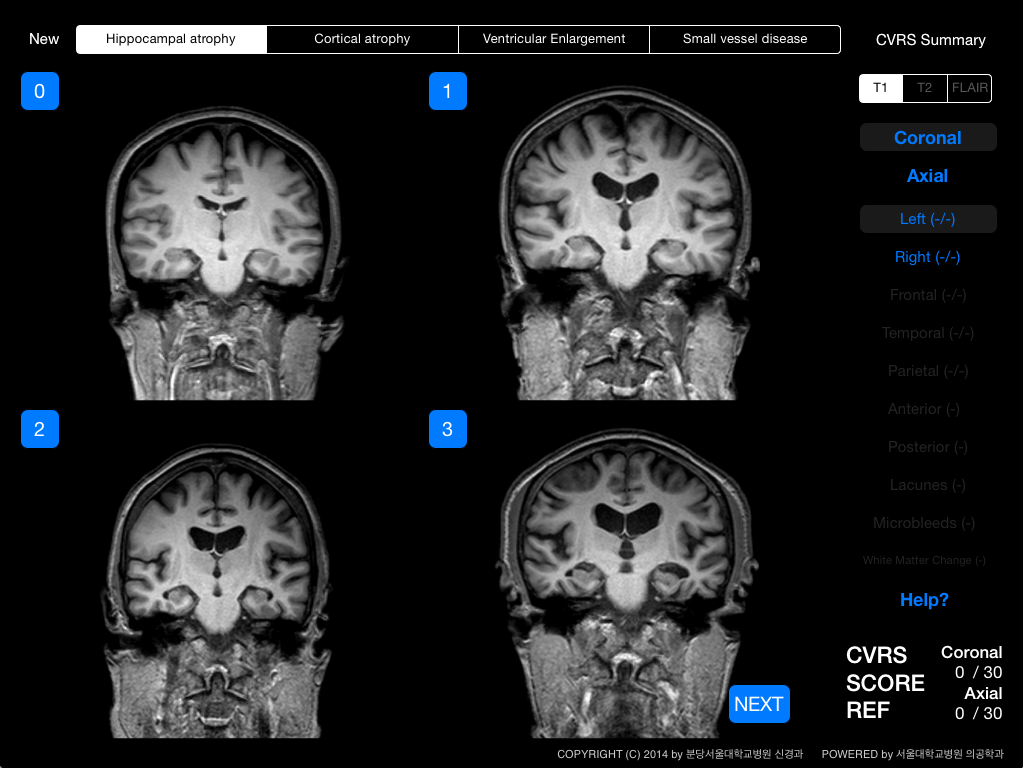
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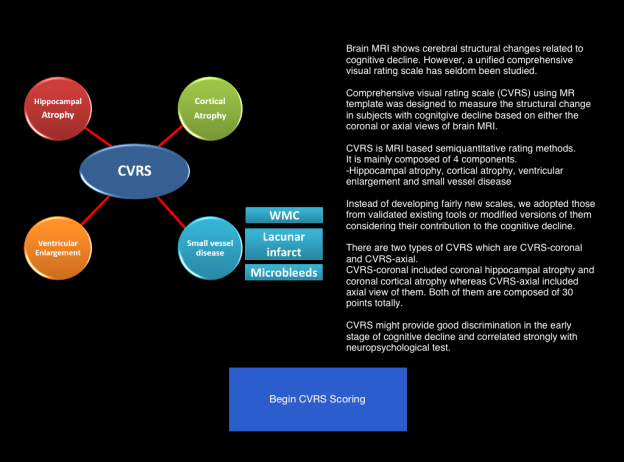
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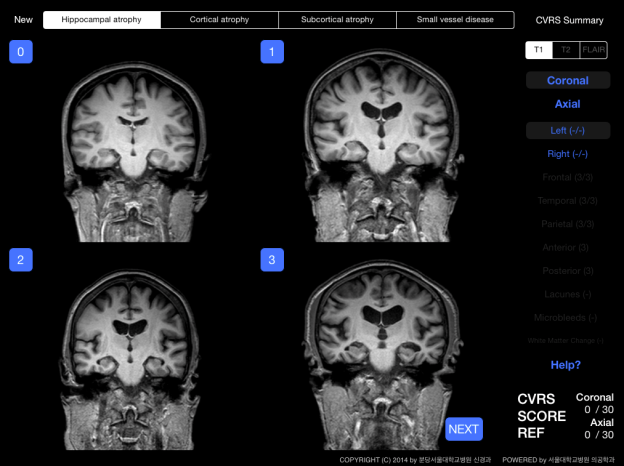
The raters used a template-based scoring program on a tablet computer that summed the total score automatically by matching the closest template image to the real magnetic resonance imaging (MRI) finding of the subject. The main screenshot of this software is as follows.



The upper menu bar indicates the 4 subscales (hippocampal atrophy, cortical atrophy, ventricular enlargement, and small vessel disease). The user can move to each of them by touching it. The right menu bar shows the summed score as well as the imaging modality. Although the CVRS is based on intuitive visual ratings, help buttons show the principles of each visual rating described in the methods section. Detailed screenshots of the CVRS follow.

1. The first screenshot for the CVRS. It includes the introduction. The user can move to the scoring section by touching the blue button labeled *Begin CVRS Scoring* at the bottom of the screen.

2. Hippocampal atrophy (coronal or axial views). By matching and touching the closest template image to the real MRI finding of the subject, the score for coronal or axial hippocampal atrophy is automatically calculated in the right menu bar. The user can move to the grade-4 image by touching the *next* button at the right lower side of the screen. Left and right hippocampal atrophy are measured separately by using the buttons labeled *left* and *right* in the right menu bar.

3. Cortical atrophy (coronal or axial views). Frontal, temporal, and parietal atrophy can be rated. The user can move to the image of each lobe by touching the buttons labeled *Frontal*, *Temporal*, or *Parietal* in the right menu bar. The ratings are done for the three lobes for the coronal or axial views.

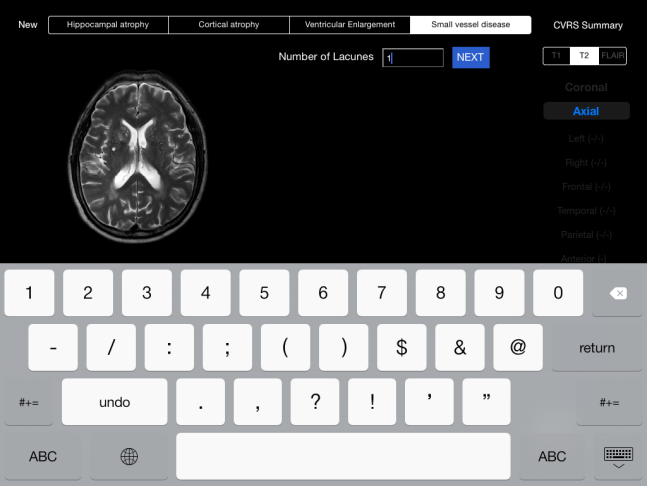
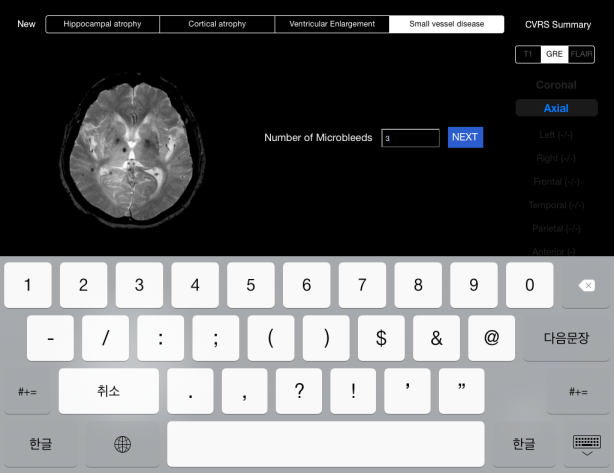
 

4. Ventricular enlargement. Ventricular enlargement was measured by rating the enlargement of the anterior and posterior lateral ventricles separately (Left figure).

5. The white matter change (WMC). WMC was measured according to the modified Fazekas and Scheltens scale (Right figure).

6. The number of lacunes and microbleeds are entered, and their scores are automatically calculated as grade 0 (no lesions), grade 1 (1–4 lesions), or grade 2 (5 or more lesions).

7. The summary of the scores. The summary shows the total summed score of the CVRS as well as the subscores of the subscales (left figure). Personal information can be entered for the subjects, and all of the data can be transferred to a server or individual E-mail (right figure).

**Supplementary Table 1.** MR acquisition parameters

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Brain MRI scan parameter** | | | | | | | | | | |
|  | **T2** | | **FLAIR** | | **T1** | | **GRE** | | **3DT1** | |
| **1.5T** | **3T** | **1.5T** | **3T** | **1.5T** | **3T** | **1.5T** | **3T** | **1.5T** | **3T** |
| **TR (ms)** | 4844 | 3000 | 11000 | 11000 | 505 | 600 | 725 | 818 | 8 | 8.1 |
| **TE (ms)** | 100 | 80 | 140 | 125 | 11 | 9.5 | 23 | 18 | 3.7 | 4.6 |
| **TI (ms)** |  |  | 2500 | 2800 |  |  |  |  |  |  |
| **FA (°)** | 90 | 90 | 90 | 90 | 69 | 50 | 18 | 23 | 8 | 8 |
| **FOV** | 220 | 230 | 220 | 230 | 220 | 230 | 220 | 230 | 240 | 240 |
| **Matrix** | 320 | 400 | 256 | 352 | 256 | 256 | 256 | 256 | 240 | 240 |
| **The number of slices** | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 175 | 175 |
| **slice thickness /gap** | 5 mm /1 mm | 5 mm /1 mm | 5 mm /1 mm | 5 mm /1 mm | 5 mm /1 mm | 5 mm /1 mm | 5 mm /1 mm | 5 mm /1 mm | 1 mm /0 | 1 mm /0 |

**Supplementary Table 2.** The scoring system and construction of the SNSB-D.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Cognitive domain | Score | % | Subtests | Maximal points |
| Attention | 17 | 6 | Digit span forward  Digit span backward | 9  8 |
| Language and  related function | 27 | 9 | Short form of K-BNT (A form)  Calculation  (3items each for addition, subtraction, multiplication, division) | 15  12 |
| Visuospatial function | 36 | 12 | RCFT copy | 36 |
| Memory | 150 | 50 | Orientation  SVLT free/delayed recalls  SVLT recognition  RCFT immediate/delayed recalls  RCFT recognition | 6  48  12  72  12 |
| Frontal /Executive function | 70 | 23 | Motor impersistence  Contrasting program  Go-no-go test  Fist-edge-palm  Luria loop  Category word generation (animal)  Phonemic word generation  Stroop test-color reading | 3  3  3  3  3  20  15  20 |
| GCF score | 300 | 100 |  |  |

K-BNT, Korean-Boston naming test; RCFT, Rey-complex figure test; SVLT, Seoul verbal learning test; GCF, global cognitive function

**Supplementary Table 3.** Scheltens’ visual rating scale.

|  |  |  |  |
| --- | --- | --- | --- |
|  | A: Hippocampus | C: Choroidal fissure | D: Temporal horn |
| Grade 0 | N | N | N |
| Grade 1 | N | ↑ | N |
| Grade 2 | ↓ | ↑↑ | ↑ |
| Grade 3 | ↓↓ | ↑↑↑ | ↑↑ |
| Grade 4 | ↓↓↓ | ↑↑↑ | ↑↑↑ |

↑,increase; ↓,decrease; N, normal.

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A

C

D

A, Height of hippocampus; C, Width of choroidal fissure; D, Width of temporal horn.

**Supplementary Table 4.** Axial hippocampal visual rating scale.

|  |  |  |  |
| --- | --- | --- | --- |
|  | A: Hippocampus | C: Cistern | D: Temporal horn |
| Grade 0 | N | N | N |
| Grade 1 | N | ↑ | N |
| Grade 2 | ↓ | ↑↑ | ↑ |
| Grade 3 | ↓↓ | ↑↑↑ | ↑↑ |
| Grade 4 | ↓↓↓ | ↑↑↑ | ↑↑↑ |

↑,increase; ↓,decrease; N, normal.

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A

C

D

A, Width of hippocampus; C, Width of Crural and ambient cistern; D, Width of temporal horn

**Supplementary Table 5.** The effects of subscales of CVRS on SNSB-D by multiple linear regression analysis.

|  |  |  |  |
| --- | --- | --- | --- |
| Visual rating scales | Standardized β coefficient | t value | p value |
| Hippocampal atrophy | -0.226 | -3.364 | 0.001 |
| Cortical atrophy | -0.207 | -3.682 | <0.001 |
| Ventricular atrophy | -0.231 | -3.296 | 0.001 |
| Small vessel disease | -0.167 | -3.279 | 0.001 |
| Adjusted R2 = 0.366 | | | |