VALIDITY AND RELIABILITY OF A SEMI-AUTOMATIC METHOD FOR MEASURING WHITE MATTER HYPERINTENSITY VOLUME

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Introduction: White matter hyperintensity (WMH) on MRI has been considered as a reliable biomarker of small vessel damages of cerebrovascular disease, mixed dementia and Alzheimer's disease.

Aims: We developed semi-automatic volumetric measuring method of WMH and tested the reliability and validity by comparing with other qualitative rating scales.

Methods: Fifteen subjects with dementia and cognitively impairment (age 71-88 yrs, male 5 and female 10) with variable WMH were recruited. FLAIRE MRI image was obtained and Analyze version 10.0 was used for the image processing and volumetric measurement of WMH. For the gold standard of the WMH volumetric measurement, threshold method was applied with manual editing of each slice of the MRI images. To measure the WMH volume, semi-automatic threshold method in the Analyze was used. Histogram of the all slices of the FLAIRE MRI was generated to calculate the optimal voxel intensity of threshold, and the lowest threshold was calculated as mean+1.4 S.D. The associations between WMH volumetric methods were expressed as Spearman's correlation. Inter- and intra-rater reliability of semi-automatic volumetric methods was determined by intraclass correlation coefficient (ICC).

Results: Correlation coefficient between the gold standard and the semi-automatic WMH volumetry was 0.999 (p=0.0001). Correlation coefficient between the manual and Scheltens visual rating scale was 0.71-0.78. Inter- and intra-rater reliability of semi-automatic WMH volumetry was excellent (ICC= 0.95 and 0.99).

Conclusions: The semi-automatic volume measuring method of WMH was a valid and reliable method to quantify subcortical white matter damages of various etiologies.