

TRACK FLORBETAPIR PET BASED FIBRILLAR AMYLOID MEASUREMENTS USING A CEREBRAL WHITE MATTER REFERENCE REGION-OF-INTEREST

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Summary

Using florbetapir PET data from 332 subjects in ADNI, we demonstrate improved power to track longitudinal fibrillar A β changes and evaluate A β -modifying treatments using a cerebral white matter (WM) ROI (JNM, K Chen, et al., 2015). Using the established procedure and the constructed cerebral WM reference ROI, we now completed the computation of the SUVR for total of 593 subjects. We examined and compared the results based on these 593 subjects and the ones based on the 332 subjects.

Methods

Part 1, Baseline and 24-month follow-up florbetapir PET scans from new 261 subjects were included in this round analysis (in addition to the 332 subjects used in our previous analysis and published in JNM). SUVR value for each visit of each patient was using the WM (eroded corpus callosum/centrum semiovale) reference ROIs. We quickly computed the sample size to track SUVR changes and evaluate A β -modifying treatment effects for A β + and A β - pAD, MCI, and NC and cognitively normal apolipoprotein E4 (APOE4) carrier and non-carrier sub-groups.

Part 2, Image Processing Steps and Names and Versions of Software used

All images downloaded from LONI (<http://adni.loni.usc.edu/methods/pet-analysis/pre-processing/>) were fully processed by LONI (Co-registered dynamic, Averaged, Standardized Image and Voxel Size, and Uniform Resolution). The images were then spatially normalized to the SPM template using SPM8 (Wellcome Trust Center for Neuroimaging, UCL, UK) in MATLAB R2009b (Mathworks, Natwick, MA). The in-house developed procedure was used to calculate the SUVR values using the procedure developed by Avid but with the new cerebral white matter reference region.

Results

Using the WM reference ROI, we estimate the need for far fewer pAD, MCI, A β + NC, and APOE4-carrying NC subjects to detect an amyloid-modifying treatment effect in a 12-month placebo-controlled trial in contrast to use of cerebellar or pontine reference ROIs (see table below).

	NC A β +	NC A β -	MCI A β +	MCI A β -	pAD A β +	pAD A β -	ϵ 4 Carriers	ϵ 4 Non-Carriers
Cerebellum	1046	2640	5493	8766	9101	4481	1011	3315
Cerebral WM	174	823	242	972	147	493	395	637

Uploaded data:

We uploaded the baseline and 24-m followup SUVR value pairs for each of the 593 subjects included in our analysis (the results for the original 332 were included in this upload again).

Conclusions

A WM white matter reference ROI can help improve the power to track longitudinal fibrillar A β increases, relate them to longitudinal cognitive decline, and evaluate A β -modifying treatments with improved statistical power.

Version Information

This is the second document submitted from Banner Alzheimer Institute regarding the SUVR calculation using the newly developed cerebral white matter reference region for florbetapir PET image analysis. Results for additional subjects will be available very soon to upload.

Dataset Information

This methods document applies to the following dataset(s) available from the ADNI repository:

Dataset Name	Date Submitted
Reiman/Chen Lab – mcSUVRwm2 Analysis Version 19.0	13 July 2015

About the Authors

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