ADNI Alzheimer's Disease Neuroimaging Initiative

Alzheimer's Disease-Related Amyloid Convergence Index

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SUMMARY

Background
We previously developed a voxel-based image analysis algorithm to characterize a "hypometabolic convergence index (HCI)" that reflects the extent to which the pattern and magnitude of hypometabolism in a person's flourodeoxyglucose positron emission tomography (FDG PET) image corresponds to that in patients with the clinical diagnosis of Alzheimer's dementia [1]. We subsequently extended this approach to the characterization of an "amyloid convergence index (ACI) that reflects the extent to which the pattern and magnitude of amyloid PET measurements corresponds to that in patients with the clinical diagnosis of Alzheimer's dementia [2]. In this study, florbetapir PET scans were used to compute ACIs in 1101 ADNI scans and compare them to mean cortical-to-cerebellar standard uptake value ratios of the probable Alzheimer's disease (AD), mild cognitive impairment (MCI), early MCI and normal control (NC) subject groups.

Method
SPM8, MATLAB R2009b, and our automated ACI algorithm routine were used to compute ACIs from florbetapir PET scans in 123 probable AD patients, 295 MCI patients, 363 early MCI patients, 13 SMC and 307 NCs.

Image Processing Steps and Names and Versions of Software used
All pre-processed images were downloaded in NIFTI format from LONI. See http://adni.loni.ucla.edu/methods/pet-analysis/pre-processing/ for the pre-processing details. The images were then spatially normalized to an SPM template using SPM8 (Wellcome Trust Center for Neuroimaging, UCL, UK) in Matlab R2009b (Mathworks, Natwick, MA).

Results
There were close correlations between ACIs and mean cortical SUVRs in the probable AD (r=0.89, N=96), MCI (r=0.92, N=279), eMCI (r=0.92, N=340), NC (r=0.87, N=294), and over all subjects (r=0.9), all with p<1.1e-16. Note the N value for each group was the number of subjects used in the correlation analyses whose mean-cortical SUVR values are available to download from ADNI LONI website.

Conclusion
ACI measurements provide an alternative to mean cortical SUVRs in the assessment of fibrillar amyloid-β burden. Additional studies are needed to compare these measurements in the detection, tracking, and differential diagnosis of AD.

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Version Information

This is the first document submitted from Banner Alzheimer Institute regarding Amyloid Convergence Index (ACI) for ADNIGO/2.

Dataset Information

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

Dataset Name	Date Submitted
Reiman/Chen Lab – ACI Table Version 17.0	06 August 2013

References

1. K. Chen, N. Ayutyanont, J. B. Langbaum, A. S. Fleisher, C. Reschke, W. Lee, X. Liu, D. Bandy, G. E. Alexander, P. M. Thompson, L. Shaw, J. Q. Trojanowski, C. R. Jack, Jr., S. M. Landau, N. L. Foster, D. J. Harvey, M. W. Weiner, R. A. Koeppe, W. J. Jagust, and E. M. Reiman, "Characterizing Alzheimer's disease using a hypometabolic convergence index," *Neuroimage.*, vol. 56, no. 1, pp. 52-60, May 2011.

2. H. Protas, K. Chen, A. Roontiva, N. Ayutyanont, X. Liu, S. Parks, M. Nishimura, C. Reschke, W. J. Jagust, N. L. Foster, M. W. Weiner, A. S. Fleisher, E. M. Reiman . "Standard and Novel PET Measurements of Amyloid Burden, Relationships to Clinical Severity, and Relationships to an AD-Related Hypometabolic Convergence Index in Early MCI", Human Amyloid Imaging Conference, Miami, January 12-13, 2012.

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