ADNI Alzheimer's Disease Neuroimaging Initiative

Hippocampal Glucose Metabolism Sampling, the NYU HIPMASK

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Summary

FDG-PET studies typically rely upon either the Regions-Of-Interest (ROI) technique, the radial surface projection method (Neurostat) or the Voxel-Based Analysis (VBA) technique. The ROI technique can achieve high anatomical accuracy but requires time-consuming manual outlining of the ROIs on MRI-coregistered PET scans. The methods currently included in the ADNI dataset, are not optimized for hippocampal (HIP) metabolism sampling. The Neurostat method preserves only the maximum metabolic activity along each projection ray, thus rendering the HIP hypometabolism invisible (radial rays intercept a "hot" cortical layer). The VBA approach has the advantage of enabling one to examine the whole-brain across subjects on a voxel-by-voxel basis. However, NYU studies show that VBA hippocampal findings are inaccurate in elderly subjects at risk for or with dementia due to large errors in spatial alignment of the relatively small and anatomically variable position of the HIP (1). To overcome these difficulties, we developed, validated, and published the HIPMASK (1) technique for measurement of the HIP and other structures. HIPMASK generates a 3-D HIP sampling mask to accurately sample true HIP tissue with approximately 95% anatomical overlap between the HIPMASK and the coregistered MRI in normal elderly, MCI and AD groups.

Method

Creation of HIPMASK ROIS

HIPMASK is an automated technique based on optimization of positive likelihood ratio and enabling the rapid PET sampling of the brain subregions (including hippocampus and pons). The HIPMask data presented includes pons normalization, which is more effective than whole brain normalization.

HIPMASK was applied without bias to all 24-month longitudinal patients in the ADNI-1 sample. No cases were excluded. PET data was downloaded from LONI, in the most processed format (Co-reg, Avg, Std Img and Vox Siz, Uniform Resolution).

While HIPMASK tissue sampling can be accomplished with or without the benefit of coregistered MRI, for this presentation all data were derived without reference to MRI. A small random subset of the AD patients studied with HIPMASK were visually examined and found to

be sampled accurately based on visual inspection of registered MRI. Bilateral hippocampal data are expressed with the pons as the reference region using the NYU ROI Template (2).

References

1. Mosconi, L.; Tsui, W.H.; De Santi, S.; Rusinek, H.; Li, J.; Convit, A.; Li, Y.; de Leon, M.J. Reduced hippocampal metabolism in MCI and AD: An automated image analysis. Neurology, 64, 1860-1867, 2005.
2. Li,Y; Rinne,JO; Mosconi,L; Pirraglia,E; Rusinek,H; DeSanti,S; Kemppainen,N; Någren,K; Kim,BC; Tsui,W; de Leon,M.J. Regional analysis of FDG and PIB-PET images in normal aging, mild cognitive impairment, and Alzheimer's disease. Eur J Nucl Med Mol Imaging, 35, 2169-81, 2008

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