Structural Neuroimaging for Early Detection of Alzheimer's Disease

Linda K McEvoy
Department of Radiology, UCSD, lkmcevoy@ucsd.edu

Collaborators:
Anders Dale, Christine Fennema Notestine, James Brewer, Donald Hagler Jr., Dominic Holland, Cooper Roddey, David Karow, Steven Edland, David Salmon, Paul Aisen

Supported by: NIA K01AG029218; R01AG031224; ADNI data collection and sharing NIA U01 AG024904
**Background**

- To enable earlier detection of Alzheimer’s disease (AD) diagnostic criteria are being revised to include the presence of characteristic biological features, or biomarkers.

- Structural MRI is an attractive biomarker because it is noninvasive, widely available, often used to rule out other conditions, and very sensitive to the atrophy that occurs in mild and prodromal AD.

- Our research focuses on improving early detection of AD through the use of quantitative structural MRI.
FreeSurfer based methods are used to derive individual-specific measures of regional volume and thickness.

Dale et al., 1999; Fischl et al. 1999; 2002; 2004; Desikan et al. 2006
Using discriminant analysis, we identified an atrophy pattern that discriminated 139 healthy controls from 84 AD patients from the Alzheimer’s Disease Neuroimaging Initiative (ADNI), then applied this discriminant function to data from ADNI’s amnestic MCI subjects.

83% Sensitivity
93% Specificity
Overall accuracy 89%
AUC = 0.915
Fully cross-validated (leave one out)
Regional mean thickness differences (mm) relative to healthy controls

MCI patients with AD atrophy have higher risk of converting to AD.

Selectively enrolling MCI patients with AD atrophy in a clinical trial would enable sample size reductions of up to 60%.

McEvoy et al. Radiology 2009; McEvoy et al. ADAD, 2010