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NEWS

Tract Based Spatial Statistics in Persons who Will Develop Alzheimer's Dementia: A Study from the Alzheimer's Disease Neuroimaging Initiative (ADNI)

Sunday 11:45-11:55 AM | SSA19-07 | Room: E351

PURPOSE

To quantify differences in diffusion tensor imaging of persons who decline from normal cognition to Alzheimer's dementia compared to controls who do not develop dementia.

METHOD AND MATERIALS

All subjects were from ADNI2 (n = 20). Average age was 73.4 ± 3.9 years with age range 68.2-83.7 years. All subjects were age and gender-matched for comparison. The sample was 60% women and 40% men. Each subject received 3T MR imaging on either a Siemens or GE scanner for T1 volumetric imaging, MP-RAGE for Siemens or SPGR for GE. All DTI scans were obtained on a 3T GE scanner. Raw T1 and DTI DiCOM images were converted to NiFTI file format. Each scan was visually inspected for gross artifacts. Images were corrected for motion, eddy currents and skull-stripped using the fMRI software library (FSL). Fractional anisotropy (FA), mean diffusivity (MD), axial diffusivity and radial diffusivity (RD) maps were also obtained via FSL's dtifit and FSLmaths tools and visualized for errors. Data were then processed through FSL's tract-based spatial statistics (TBSS) with default parameters. FA, MD, RD, and axial diffusivity values were extracted.

RESULTS

Of the 20 subjects, 10 experienced longitudinal cognitive decline and 10 remained cognitively normal. Of the 10 converters, 80% were MCI at baseline and converted to AD and of these 50% declined after 6 months and another 50% declined after 12 months. Of the remaining two converters, one declined from normal to mild cognitive impairment (MCI) to AD after 24 months and another subject experienced a similar trajectory after 48 months. Comparing global DTI metrics, there was a trend towards statistical significance with respect to lower global mean FA in converters compared to non-converters ($t = -.43$, $p = .07$). However, voxel wise analyses with TBSS showed statistically significant reductions in frontal white matter tracts in converters compared to non-converters as shown in Figure 1 (red arrows). There were no statistically significant differences in other global DTI metrics including RD, MD, and axial diffusivity.

CONCLUSION

Diffusion weighted MR imaging identifies quantifiable differences between AD converters compared to non-converters.

CLINICAL RELEVANCE/APPLICATION

Identification of non-invasive quantitative neuroimaging biomarkers that predict cognitive decline to Alzheimer's dementia is important for determining persons who may benefit from drug trials or modification of risk factors.