ABSTRACT

- **Background**
  - There is a paucity of studies that address the utility of whole brain functional and structural connectivity analysis in MCI and early dementia.
- **Objectives**
  - To study differences in resting state functional MRI (rsfMRI) determined functional connectivity and tractography-estimated structural connectivity in early AD relative to controls and cognitively stable MCI.

METHODS

rsfMRI and 3D T1-weighted anatomical images were acquired using 3 Tesla scanner on 17 early AD (CDRs1), 17 longitudinally-stable MCI and 17 controls. Group level independent component analysis was used to derive rsfMRI networks. Dual regression was performed on the coherent networks and threshold free cluster enhancement (TFCE) were implemented with a significance of p<0.05 (family-wise-error correction). Grey-matter volumes were analysed by voxel-based-morphometry (VBM) and the structural integrity was analysed by Tract-Based-Spatial-Statistics (TBSS).

RESULTS

- Fig 1: Shows reduced functional connectivity (FC) in AD compared with controls (p<0.05) TFCE, FWE-corrected; p<0.05; MNI coordinates (X=36, Y=43, Z=35); (22% PCG, 6% Lingual Gyrus, 5% PHG, posterior)
- Fig 2: Shows reduced FC in AD compared with MCI (p<0.05); TFCE uncorrected, p<0.05; MNI coordinates (X=36, Y=43, Z=35); 33% PC, 9% PCG
- Fig 3: Shows decreased FC in MCI compared with controls (p<0.05); TFCE uncorrected, p<0.05; MNI coordinates (X=41; Y=37; Z=45); 76% PCG

CONCLUSIONS

- Early AD group compared to controls and MCI revealed reduced functional connectivity in default-mode network (precuneus, posterior cingulate gyrus) (Fig 1, 2). MCI compared to controls revealed reduced FC in posterior cingulate gyrus (Fig 3). The posterior cingulate gyrus and precuneus being the seat of visual attention and encoding, forms the most important seed for functional connectivity mapping in classifying early AD and sub-classifying MCI due to AD.
- TBSS analysis revealed structural changes in forcesps minor, forcesps major, inferior longitudinal fasciculus, IFOF in AD compared to controls and MCI. (Fig 4.) Structural and functional connectivity differences in MCI have similar network topography, however are less robust in comparison to AD. With significant correlations derived between HC volume and recall scores (r=0.642, p=0.01) structural and FC changes in MCI and AD appear to be independent of neuropsychology and could serve as potential imaging biomarkers for MCI due to AD.

REFERENCES