Assessment of White Matter Tract Damage in Mild Cognitive Impairment and Alzheimer's Disease

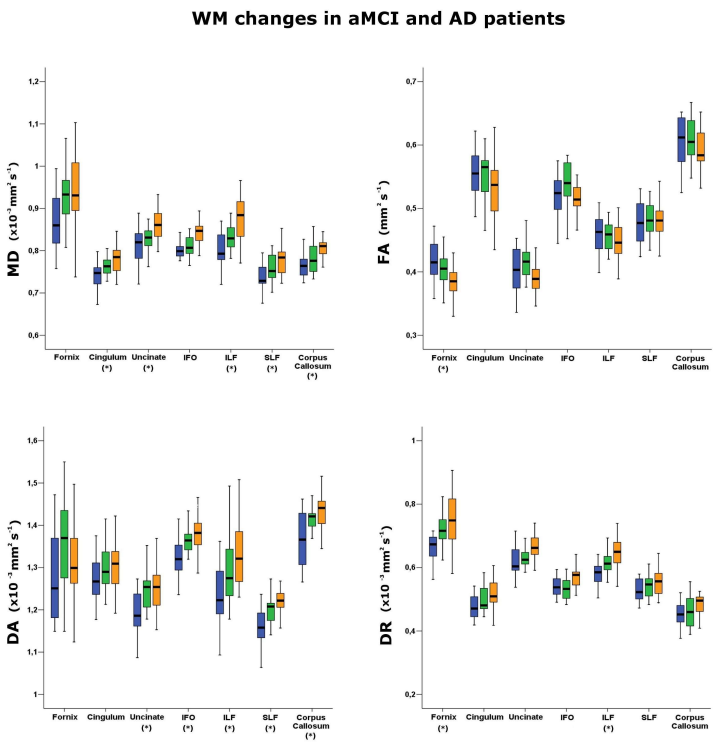
M. Pievani[1,2], F. Agosta[1], E. Pagani[1], E. Canu[3], S. Sala[1], M. Absinta[1], C. Geroldi[3], R. Ganzola[3], G. B. Frisoni[3], and M. Filippi[1]
[1]Neuroimaging Research Unit, Institute of Experimental Neurology, Division of Neuroscience, Scientific Institute and University Hospital San Raffaele, Milan, Italy, [2]IRCCS Centro San Giovanni di Dio - Fatebenefratelli, Brescia, Italy, [3]IRCCS Centro San Giovanni di Dio - FatebenefratelliIRCCS Centro San Giovanni di Dio - Fatebenefratel, Brescia, Italy

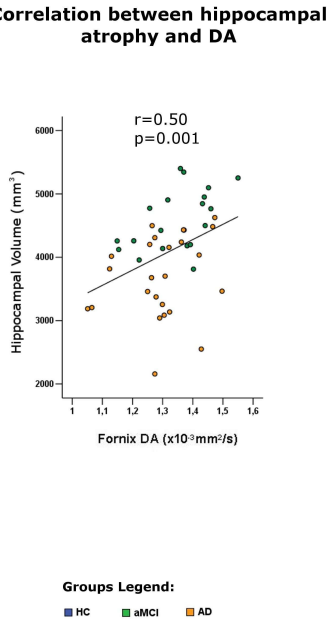
Introduction. Pathological and imaging studies indicate that white matter (WM) damage occur in Alzheimer's disease (AD) [1,2,3]. The regional pattern of such WM damage however is largely unknown and the underlying mechanisms have been poorly investigated.

Methods. Diffusion tensor MRI-based tractography was used to investigate WM changes in the major limbic (i.e, fornix and cingulum) and cortico-cortical association tracts (i.e., the uncinate fasciculus, the inferior fronto-occipital fasciculus, the inferior longitudinal fasciculus [ILF], the superior longitudinal fasciculus, and the corpus callosum) in 25 AD patients, 19 amnestic MCI (aMCI) patients, and 15 healthy controls (HC). Mean diffusivity (MD), fractional anisotropy (FA), axial (DA) and radial (DR) diffusivities were measured for each tract, using an atlas-based tractography approach [4]. The association of WM tract integrity with hippocampal volume was also assessed.

Results. Significant differences among groups in MD values were found in all WM tracts ($p \leq 0.03$, ANCOVA), except in the fornix ($p=0.06$) and inferior fronto-occipital fasciculus ($p=0.09$). Conversely, FA was significantly different among groups in the fornix only ($p=0.02$). These differences were significant in AD group only on post-hoc analysis ($p<0.05$). DA values were significantly increased in both AD and aMCI in cortico-cortical tracts ($p \leq 0.01$), and DR was significantly increased in the fornix (p=0.02), and in the ILF in AD only ($p=0.01$). The limbic tracts showed greater increase in DR than DA when considering aMCI and AD patients, whereas no difference was found between DA and DR in cortico-cortical tracts. Hippocampal volumes were significantly correlated with DA values in the fornix.

Conclusions. This study shows a different pattern of WM changes in the limbic and cortico-cortical association tracts in aMCI and AD patients. These findings suggest that different pathological mechanisms may be responsible for such WM changes.





References
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