

Mapping Cortical Atrophy in Parkinson's Disease Patients with Cognitive Impairment and Dementia

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Background

Cognitive impairment is exceedingly common in patients with Parkinson's disease (PD). Prior to transitioning to PD dementia (PDD), PD subjects transition through a state of mild cognitive impairment (PDMCI). Brain changes accompanying cognitive decline in PD are still not fully established.

Methods

We applied cortical pattern matching and cortical thickness analyses to the 3D T1-weighted brain MRI scans of 20 age-matched cognitively normal elderly (NC), 11 cognitively normal PD (PDND), 7 PDMCI, and 13 PDD subjects. We used linear regression models to investigate the effect of diagnosis on cortical thickness. All maps were adjusted for multiple comparisons using permutation testing with a threshold $p < 0.01$.

Results

As there were significant differences in age and education between groups, these variables were used as confounders in our analyses. PDD subjects showed 10-30% thinner bilateral inferior sensorimotor, perisylvian, and entorhinal as well as left precuneal and right inferior temporal cortices relative to NC (left $p_{\text{corrected}} = 0.012$, right $p_{\text{corrected}} = 0.0009$). PDD subjects showed 10-30% thinner bilateral inferior sensorimotor and frontal cortices relative to PDND (left $p_{\text{corrected}} = 0.07$, right $p_{\text{corrected}} = 0.05$). PDMCI showed 10-20% thinner bilateral precuneal and right inferior sensorimotor and perisylvian cortices relative to NC, but only the right hemispheric differences showed trend-level significance after map-wise permutation correction ($p_{\text{corrected}} = 0.09$).

Conclusion

Our data suggests that cognitive decline in PD is associated with cortical loss. Affected areas show up to 20% thinning in PDMCI and up to 30% thinning in PDD. Cortical thickness shows promise as an imaging biomarker for PDMCI and PDD.