Impaired Brain Network Architecture of Alzheimer Disease base on Multicenter resting fMRI

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Background: The patterns of whole brain connectivity/network in Alzheimer’s disease (AD) have been studied by using multimodal imaging techniques. And these studies convergent suggest that alterations in widely distributed pair of functional connectivity are prevalent in AD. However, all these studies based on a relative small sample size from one single imaging center which might will undermine the reliability of each single study.

Methods: We explored abnormal fMRI functional connectivity in a large sample of patients with AD (N=263) and age-matched healthy volunteers (N=279) from 7 imaging centers. We extracted regional mean fMRI time series from 264 ROIs representing 14 resting networks (RSN) which covers the whole brain and has been widely. Then we performed mega-analysis to identify the most robust impaired functional connectivity in AD.

Results: We found that patients had reduced strength of functional connectivity, in several regions previously described as components of the default mode network. In AD, functional connectivity was particularly attenuated between regions that were separated by a greater physical distance. This profile of functional abnormality in AD was consistent with the results of a comparable analysis of data on amnestic mild cognitive impairment (N=200). Greater degree of cognitive impairment was correlated with greater attenuation of functional connectivity. These results indicate that neurodegenerative disruption of connectivity in AD affects long distance connections. We also found increased short-distance functional connectivity within the prefrontal lobe. These increases local functional connectivity in prefrontal lobe reflect a compensatory reallocation or recruitment of cognitive resources in AD.

Conclusions: For the first time, we provide a robust impaired connectivity pattern in AD based on multi-center resting fMRI data. This profile indicating the potential of resting-state fMRI measures as biomarkers or predictors of disease progression in AD.