Disconnection of frontal and parietal areas contributes to impaired attention in very early Alzheimer's disease.

Abstract:
In Alzheimer's disease (AD), the loss of cerebral connectivity has been evidenced by numerous studies. There is growing evidence of attention related failures already in prodromal stages of AD; however, connectivity changes within attention networks have been rarely reported. Here we focused on effective connectivity of top-down attention control in patients with prodromal Alzheimer's disease (pAD). We scanned 15 pAD patients and 16 healthy elderly using the Attentional Network Task and determined effective connectivity within a cingulo-fronto-parietal network using Dynamic Causal Modeling. We related connectivity parameters to structural and behavioral parameters (gray matter volume as well as reaction time) to examine the relation between affected domains. Our analyses revealed that effective connectivity from the right middle frontal gyrus to the left superior parietal cortex as well as from the right to the left superior parietal gyrus was reduced in pAD patients. Furthermore, we found that, effective connectivity varied as a function of GM volume in the patient group: right middle frontal gray matter volume significantly correlated with connectivity from the right parietal cortex to the right middle frontal gyrus as well as from the middle frontal gyrus to the anterior cingulate cortex. In addition, inter-parietal connectivity was correlated to right and left parietal gray matter volume. We conclude that, at
very early stages of AD, the reduction of effective connectivity in fronto-parietal circuits is related to regional gray matter volume and contributes to impairments in top-down attentional control.

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