

O5-04-05: Morphological differences in the striatum in early and late-onset Alzheimer's disease

Michela Pievani, Martina Bocchetta, Marina Boccardi, Samantha Galluzzi, Matteo Bonetti, Paul Thompson, Giovanni Frisoni

Background

Imaging studies have shown that early onset (EO) and late-onset (LO) Alzheimer's Disease (AD) are associated with two distinct patterns of neuropathology. LOAD shows greater medial temporal lobe atrophy, and EOAD is associated with greater neocortical atrophy. Less is known about how the striatum is affected in EOAD and LOAD.

Methods

We investigated volume and shape changes in the striatum (nucleus accumbens, putamen, and caudate) in 18 EOAD (age: 63+4; females: 72%; MMSE: 20+4), 18 LOAD (age: 77+5; females: 83%; MMSE: 21+4) patients matched to the EOAD group for disease severity, and in 36 age-matched controls (n = 18 young controls, YC; n = 18 elderly controls, EC). The striatal nuclei were outlined by expert manual tracing on MRI. 3D parametric surface models of each nucleus were extracted with an automated shape analysis approach. Differences in striatal shape and volume were tested and mapped between EOAD and YC, and LOAD and EC.

Results

In the nucleus accumbens, the LOAD group showed lower volumes ($P < 0.01$, t-test). Local differences mapped to the caudal portion of the nucleus ($P < 0.05$ corrected with permutation testing; Figure). In the putamen, both EOAD and LOAD showed a trend for reduced volumes ($P < 0.09$, t-test), but local differences were significant in EOAD only (ventral putamen: $P < 0.05$ corrected with permutation testing; Figure). No volume difference was detected in the caudate in EOAD and LOAD, but both groups showed local shape changes ($P < 0.005$ corrected with permutation testing; Figure) including both enlargements (shown in violet) and reductions (shown in yellow-green).

Conclusions

These findings suggest that LOAD is associated with nucleus accumbens changes and EOAD with putamen abnormalities. These striatal abnormalities might reflect the distinct pattern of neuropathology in LOAD and EOAD patients (limbic vs neocortical atrophy). Caudate shape changes, which were found to be similar in EOAD and LOAD, might represent morphological reorganization due to ventricular enlargement.