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Neuroimaging / New imaging methods

PET-[18F]UCB-H for assessing synaptic density in FTD

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Abstract

Background: The behavioural variant of fronto-temporal dementia (FTD) is characterized by clinical symptoms including behavioural and cognitive changes and by neurodegenerative involvement of the anterior part of the brain. The objective was to study the in vivo distribution of synaptic loss.

Method: 12 patients with possible FTD and frontotemporal hypometabolism on FDG-PET (mean disease duration of 4 years) were compared to 12 control participants and 12 patients with Alzheimer's disease, matched for age, sex and education. Measures of verbal fluency, episodic memory and awareness of cognitive impairment did not differ between patients groups. We used [18F]UCBH-PET to assess the regional loss of synaptic density. Total distribution volume was obtained with Logan method and carotid artery derived input function. SPM12 was used to analyze pve-corrected PET and MRI images.

Result: A significant decrease of [18F]UCBH uptake was observed in the right anterior parahippocampal gyrus of FTD patients, while atrophy was observed in the ventromedial prefrontal cortex. Loss of synaptic density was observed in the right hippocampus of AD participants, while atrophy extended from the right hippocampus to bilateral posterior associative cortices. AD patients showed lower [18F]UCBH uptake in the precuneus that FTD patients. Anosognosia for clinical symptoms was correlated with synaptic density in caudate nucleus and prefrontal cortex in FTD, and with synaptic density in posterior hippocampus in AD.

Conclusion: Synaptic loss was predominant in the anterior parahippocampal gyrus of our bvFTD patients. This region is part of the limbic network and the perceptive social brain. A validated measure of anosognosia (a characteristic but variable symptom in bvFTD) was related to synaptic density in two interconnected regions, caudate nucleus and anteromedial prefrontal cortex, the later being involved in self-reference.