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Morphometric and morphological study of synapses and dendritic spines in early cases of Alzheimer's disease**Stavros J Baloyannis**
Aristotle University, Greece

Alzheimer's disease is a neurodegenerative disorder resulting in gradual decline of mental faculties leading to an almost vegetative state eventually. The study of the synaptic alterations and the dendritic and spine pathology in cortical and subcortical neurons is crucial for the correlation of the steps of the mental deterioration with the morphological changes which may disrupt the harmonious communication between neurons, causing serious mental deficits. In early case of Alzheimer's disease we attempted to study the morphology of synapses and to estimate the numerical density of synapses per dendritic arbor. In addition we studied the morphology of the dendritic spines, estimating also the spinal density per dendritic branch. The study is based on stereological methods applied in light and electron microscopy on specimens of the cerebellar cortex and the hypothalamus of brains derived from patients who suffered from Alzheimer's disease in early stages. The numerical density of synapses per dendritic branch was estimated on the basis of disector counting method. We applied also the physical disector technique on serial sections studied in transmission electron microscopy. The study revealed tremendous loss of dendritic branches, spines and synapses in AD brains in comparison with normal controls. The synaptic loss in the cerebellar cortex concerned mostly the parallel fibers and the Purkinje cell dendrites. In the hypothalamus the neurons of the suprachiasmatic nucleus demonstrated the most impressive decrease of synaptic density per dendritic branch. The morphological and morphometric alterations estimated by stereological techniques confirm that the mental decline coincides with the numerical decline of the synapses in cortical and subcortical neuronal networks in Alzheimer's disease.

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