Astrocyte clasmatodendrosis in a transgenic mouse model of Alzheimer’s Disease

Daniele Nosi¹, Daniele Lana², Maria Grazia Giovannini², Fiorella Casamenti³, Sandra Zecchi Orlandini¹

¹ Department of Experimental and Clinical Sciences, University of Florence, 50134 Florence, Italy
² Department of Health Science, University of Florence, 50134 Florence, Italy
³ Department of Neuroscience, Pharmacology, and Pediatrics, University of Florence, 50134 Florence, Italy

Aging is frequently accompanied by a low-grade inflammation (inflammaging); on the other hand, inflammation is considered a prodrome of Alzheimer Disease (AD). Indeed, a distinctive event of both aging and AD is the deposition of beta amyloid (Aβ) fibrils within the central nervous system, a condition that has been associated to cognitive decline. In a previous research we demonstrated that, in the hippocampus of aged rats, the fragmentation of astrocyte processes (clasmatodendrosis) is associated with a decrease of their activity in terms of Aβ-fibril clearance, thus promoting neuron to neuron propagation of Aβ-fibrils and therefore their prion like spread [1]. In this study we show preliminary data on the role of clasmatodendrosis in a double transgenic TgCRND8 mouse model, which overexpresses both Swedish and Indiana mutations in the human amyloid precursor protein, and displays early cognitive decline also in young animals [2]. We performed a 3D confocal analysis on optical volumes acquired in the CA1 hippocampal region of young (3m.)- and middle aged (7m)- TgCRND8 mice. We found that young TgCRND8 mice show Aβ-amyloid deposition, astrocyte clasmatodendrosis and a decrease of the astrocyte cytoskeletal marker GFAP. In middle aged animals significantly higher levels of GFAP expression, indicating astrogliosis, were in concomitance with both Aβ-amyloid deposition. These data appear to link the onset of early cognitive decline in TgCRND8 mice with astrocyte clasmatodendrosis and provide new perspectives on the role of astrocytes in Aβ-amyloid deposition and spreading.

References


Keywords

Clasmatodendosis, Alzheimer’s Disease, Aβ-fibril, Astrocytes, TgCRND8 mice