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Retinal imaging techniques in neurodegenerative diseases of the brain

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Background: Recent research suggests that Tau is the culprit lesion along with neuroinflammation in the etiology of Alzheimer's Disease (AD). Retina is the extention of the brain and is the most easily approachable part of the central nervous system. Detection of the pathological protein accumulations may be possible by using spectral domain optical coherescent tomography (SD-OCT) and fundus autofluorescein (FAF). There is evidence showing that retinal plaques start accumulating even earlier than the ones in the brain. Most recent Tau protein images in the brain consist of normal or reverse C-shaped paired hellical filaments.

Methods: 20 patients with PET proven AD were examined by SD-OCT and FAF. Mean age was 72. Hypo or hyperfluorescent retinal lesions were scanned by SD-OCT and C shaped paired hellical filaments were investigated in a masked fashion. The researchers agreed on the shape of the lesions. Both C-shaped (normal or reverse) filaments and thinner fibrillary structures were taken into consideration.

Results: In all the patients, paired hellical filaments that exactly corresponded with the histopathologic and cryo-EM images of Tau in terms of shape and dimension were detected along with thin fibrils and lesions similar to amyloid beta. The number of the retinal filaments and other abnormal proteins was in concordance with the severity of the disease process. The advanced retinal filaments had normal or reverse paired C shapes and thin fibrils had the shape of histopathologic images seen in early developmental stages of the disease.

Conclusions: Retinal images of Tau were disclosed for the first time in live AD patients. Retinal neuroimaging is a trustable biomarker and tool for monitoring the disease.

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