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White matter microstructural changes in presymptomatic and symptomatic FTD using neurite orientation dispersion and density imaging

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State of the art. Frontotemporal dementia (FTD) is characterized by abnormal white matter (WM) integrity measured with conventional diffusion tensor imaging techniques. No study has yet investigated the microstructural WM changes across different FTD forms using the novel neurite orientation dispersion and density imaging (NODDI).
Methodology. Neurite density (NDI) and orientation dispersion index (ODI) were extracted from NODDI sequences acquired on a 3T Siemens Prisma scanner. Data were available for 27 individuals with bvFTD and 27 with primary progressive aphasias (11 svPPA, 8 nfvPPA, 4 lvPPA, 4 PPA-NOS). 18 of these individuals carried an FTD-linked genetic mutation (6 *C9orf72*, 7 *MAPT*, 5 *GRN*), together with 44 presymptomatic mutation carriers (19 *C9orf72*, 12 *MAPT*, 13 *GRN*). W-scores for NDI and ODI were computed from a regression model on 62 non-carrier healthy individuals, adjusting for their age, sex and total intracranial volumes.
Results. The most abnormal values (<2.5th percentile of controls) were found in bvFTD (NDI: anterior corona radiata and cingulum), svPPA (NDI: uncinate fasciculus), and lvPPA (NDI: sagittal stratum, posterior corona radiata and thalamic radiation, superior longitudinal fasciculus; ODI: splenium of the corpus callosum), and in symptomatic *C9orf72* (NDI: anterior corona radiata and cingulum) and *MAPT* mutation carriers (NDI: uncinate fasciculus). In *C9orf72* presymptomatic mutation carriers, significantly abnormal values for NDI (<25th percentile) were found in the internal capsule, corona radiata, posterior thalamic radiation and sagittal stratum.
Conclusions. Reduced neurite density seems to be the main cause of WM changes in FTD, which was also measurable before symptom onset in *C9orf72*.

Conflicts of interest

Nothing to declare