European Huntington's Disease Network
(EHDN 2021)
September 9th–11th, 2021

Longitudinal hybrid PET/MRI in juvenile-onset Huntington disease (joHD)

Maria Eugenia Caligiuri[1], Patrizia Vizza[2], Pierangelo Veltri[1], Francesco Cicone[1], Paolo Barberio[1], Giuseppe Lucio Cascini[1], Eugenia Scaricamazza[3], Sabrina Maffi[3], Simone Migliore[3], Ferdinando Squitieri[3,4], Umberto Sabatini[1]

1. Magna Graecia University, Catanzaro, Italy
2. Mater Domini University Hospital, Catanzaro, Italy
3. Huntington and Rare Diseases Unit, IRCCS Casa Sollievo della Sofferenza/CSS-Mendel, San Giovanni Rotondo/Rome, Italy
4. Italian League for Research on Huntington (LIRH Foundation), Rome, Italy

SUMMARY

Hybrid PET-MRI is an emerging technique that allows multimodal evaluation of brain structure and function. This study evaluates longitudinal PET-MRI in one patient with stage-2 joHD, to assess changes related to disease progression. This approach might be useful to test the efficacy of disease-modifying drugs.

BACKGROUND

Juvenile-onset Huntington's disease (joHD, neurological onset≤20 years) is a rare HD variant associated with large CAG repeat-size alleles (>60), showing different clinical features from adulthood HD.

AIMS

The aim of this study is twofold: i) To evaluate multimodal hybrid PET-MRI data fusion for characterizing joHD longitudinal brain changes; ii) to identify potential markers of disease progression, which might be useful in future trials to test disease-modifying drugs.

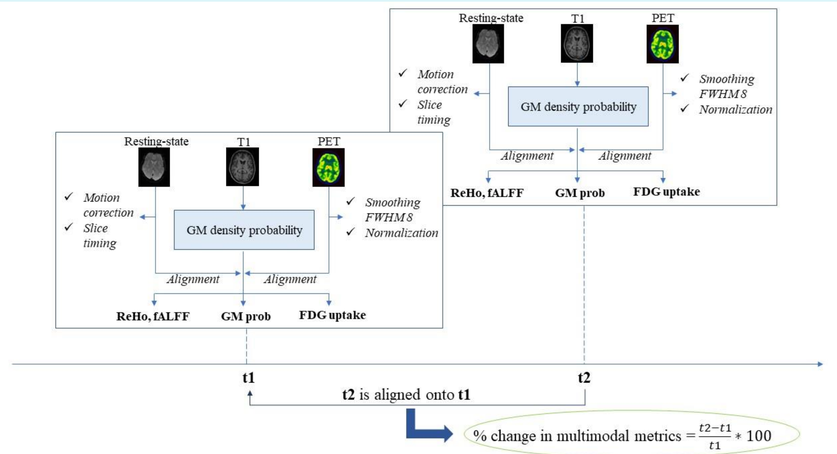

Figure 1: Workflow analysis

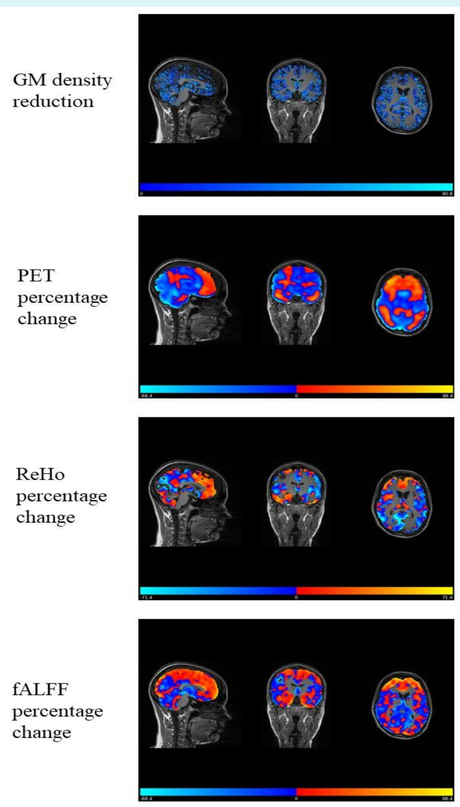

Figure 2: voxel-wise maps of percentage changes for GM density, PET, ReHo and fALFF at follow-up in the single JHD patient.

METHODS

A 20-year-old female with stage-2 joHD, 62 CAG repeats and onset at 16 years, underwent 3T [18F]fluorodeoxyglucose (FDG) PET-MRI at two timepoints (Oct 2019, UHDRS-motor score=45 units and Feb 2021, UHDRS-motor score=53 units). The protocol included the simultaneous acquisition of FDG-PET, T1-weighted and resting-state functional MRI (rs-fMRI). Voxel-wise percentage changes at follow-up relative to baseline status were calculated on (i) grey matter (GM) density, (ii) FDG-PET uptake, (iii) rs-fMRI regional homogeneity (ReHo), and (iv) rs-Fmri amplitude of low frequency fluctuation (fALFF).

RESULTS

Whole-brain GM density decreased by 31.9±21.1%. FDG uptake increased in the frontoparietal network, while decreasing in the remaining regions, including the thalamus. ReHo and fALFF followed the pattern of PET changes, also highlighting increased functional connectivity in the frontal cortex opposed to decreased connectivity in posterior regions.

CONCLUSION

Hybrid PET/MRI is an emerging technique that allows individually-tailored evaluation of brain changes. Preliminary results are promising and showed rapid structural and metabolic changes in an adult patient with stage 2 joHD, resembling the trajectories reported in the literature in advanced adult HD patients, and involving specific regions thought to be key hubs affected by this disease.