

BRAIN HYPOMETABOLISM AND ERRORS ON THE CLOCK DRAWING TEST PREDICT CONVERSION FROM MILD COGNITIVE IMPAIRMENT TO ALZHEIMER'S DEMENTIA

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BACKGROUND AND AIM

Mild Cognitive Impairment (MCI) is a heterogeneous condition associated with an increased risk of developing dementia, especially Alzheimer's dementia (AD). Several markers have been explored as predictors of conversion from MCI to AD. The Clock Drawing Test (CDT) is a screening tool revealing executive, working memory, and visuospatial deficits. Brain FDG-PET is a neuroimaging technique underlining specific hypometabolism patterns reflecting synaptic dysfunction and neuronal loss.

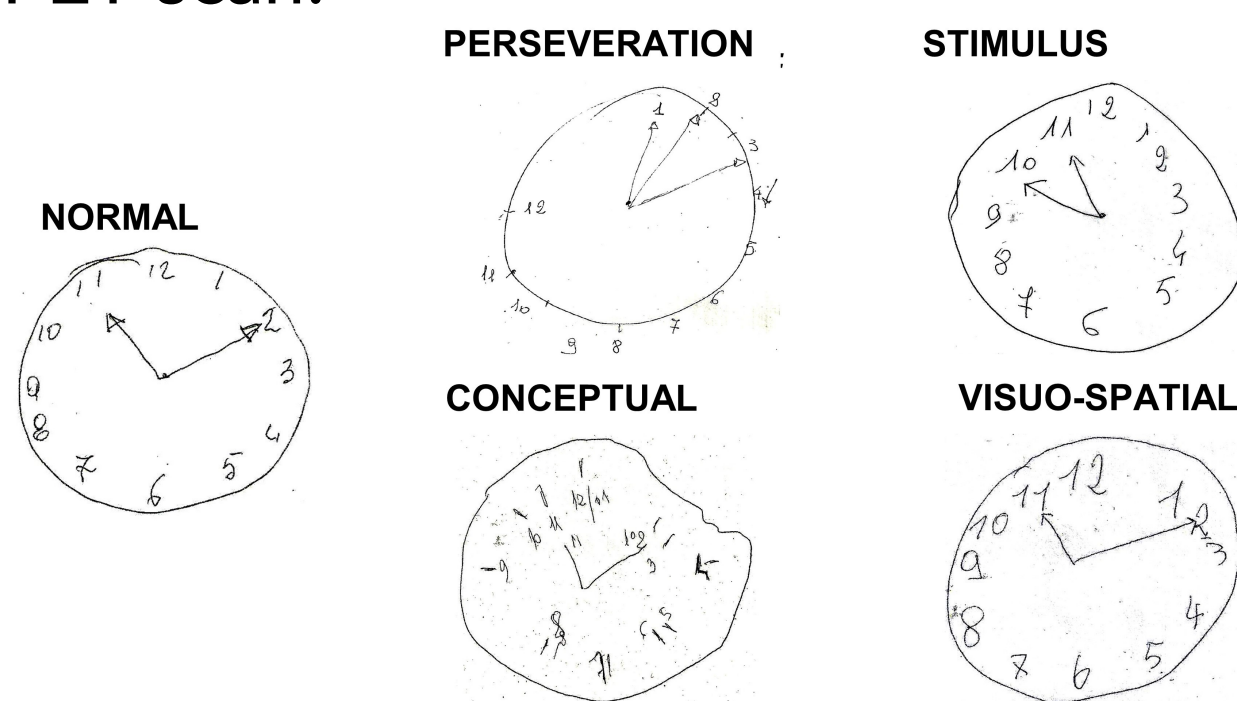
This study aimed to correlate CDT errors and FDG-PET hypometabolism patterns in MCI, evaluating the combination of different CDT errors and the brain hypometabolism pattern in predicting conversion to AD.

METHODS

We included 65 MCI with a baseline CDT and FDG-PET scan.

CDT errors were qualitatively classified in the following error groups¹:

- stimulus-bound (STIMULUS);
- conceptual (CONCEPTUAL);
- spatial (VISUOSPATIAL);
- perseveration (PERSEVERATION).



FDG-PET images were analyzed to obtain single-subject brain hypometabolism maps using a large dataset of controls for comparison.²

MCI subjects were longitudinally evaluated and classified according to the diagnosis at the follow-up in stable MCI, AD, frontotemporal dementia (FTD), or dementia with Lewy bodies (LBD).

RESULTS

- MCI subjects performing correctly to the CDT showed a normal metabolism pattern (**NORMAL**).
- The **PERSEVERATION** and the **VISUOSPATIAL** error groups showed hypometabolism in temporoparietal regions, posterior cingulate, and precuneus (corresponding to the typical AD pattern).
- The **STIMULUS** error group showed left hypometabolism in frontotemporal cortices.
- The **CONCEPTUAL** error group was characterised by widespread hypometabolism (frontotemporal, parietal, occipital cortices).

At follow-up, none of the **NORMAL** MCI converted to dementia. Conversely, in **PERSEVERATION** group, 85% of MCI converted to dementia. An AD hypometabolism pattern in **PERSEVERATION** error group predicted conversion to AD with high accuracy (AUC=85%).

DISCUSSION

Combining qualitative errors in the CDT and semi-quantitative analysis of brain FDG-PET accurately predicts conversion to AD or other dementia aiding, at the baseline, a clinicals stratification of MCI subjects.

REFERENCES

- ¹ Parsey CM et al. *Quantitative and qualitative analyses of the clock drawing test in mild cognitive impairment and Alzheimer disease: evaluation of a modified scoring system.* J Geriatr Psychiatry Neurol. 2011 Jun;24(2):108-18.
- ² Caminiti SP, Sala A, Presotto L, et al. *Validation of FDG-PET datasets of normal controls for the extraction of SPM-based brain metabolism maps.* Eur J Nucl Med Mol Imaging. 2021;48(8):2486-2499.