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FDG-PET as a predictive biomarker of conversion to dementia in Mild Cognitive Impairment (MCI) patients: a retrospective consecutive case series study

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INTRODUCTION

The alteration of cerebral metabolism represents one of the earlier biomarkers of dementia and FDG-PET is a valid and essential diagnostic tool to identify specific neurometabolic patterns in dementia variants.

OBJECTIVES

➢To ascertain the existence of neurometabolic predictors of evolution to different forms of dementia in a cohort of MCI patients.

MATERIALS AND METHODS

Participants

➢A pool of 195 subjects [106 females, 89 males; mean age 67.52 (SD 11.4); mean education 9.11 (SD 4.32)] who underwent FDG-PET between September 2009 and December 2014 and followed at Centre of Cognitive Disorders, AUSL, of Parma, Italy.

➢74 patients [38 females, 36 males; mean age 68.05 (SD 9.94); mean education 9.2 (SD 4.18)] who respected the diagnostic criteria for MCI at the moment of the FDG-PET (figure 1) were enrolled into the study and underwent clinical and neuropsychological follow-up for about two years (figure 2): 28 remained stable MCI, 33 evolved to Alzheimer's type Dementia (AD), 13 evolved to Frontotemporal Dementia (FTD).

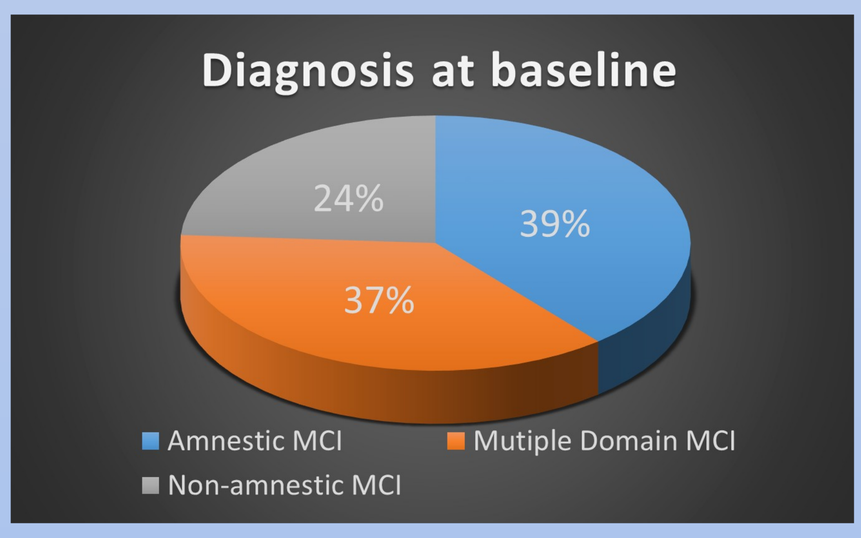

Figure 1

Procedure

➢FDG-PET scans at the baseline were compared between patients who developed AD (MCI-AD) or FTD (MCI-FTD), and those who remained Stable MCI, using Statistical Parametric Mapping software (SPM5).

➢Moreover, brain metabolism of MCI-AD patients and MCI-FTD patients was compared with that of a sample of healthy controls.

➢The analysis focused on find out both areas of decreased metabolism indicating synaptic dysfunction and increased metabolism suggestive of compensatory mechanisms.

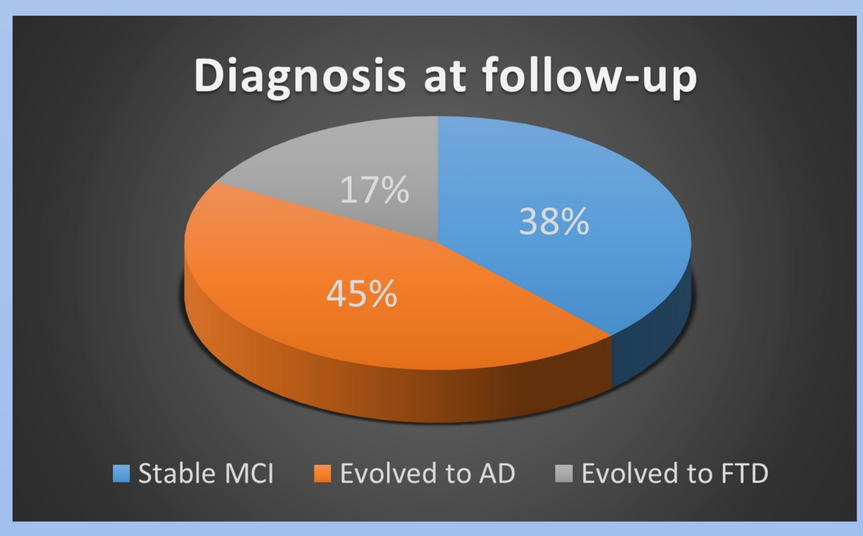

Figure 2

RESULTS

➢MCI-AD patients presented at baseline a hypometabolism in the left middle and inferior temporal gyri (BA 21, 39, 20; figure 3) and an increased metabolism in the bilateral postcentral gyri, in the right precentral gyrus, insula (BA 43, 6, 13) and in the left lentiform nuclei (putamen; figure 4), compared with stable MCI.

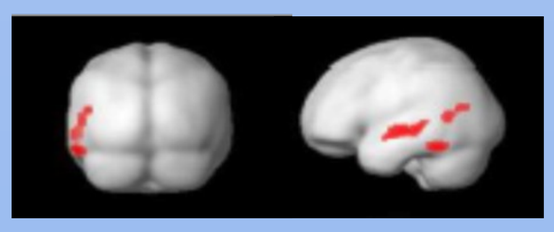

Figure 3

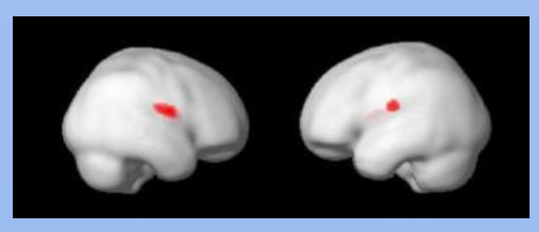

Figure 4

➢MCI-FTD presented at baseline a hypometabolism in the right inferior, middle, superior frontal gyri and inferior, middle and superior temporal gyri (BA 9, 47, 10, 20, 21, 22, 38; figure 5), compared with stable MCI. No areas of significant hypermetabolism were found.

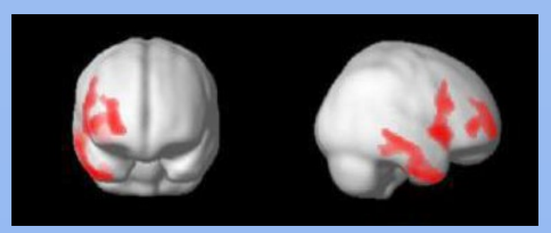

Figure 5

➢In comparison with healthy controls, MCI-AD had clusters of hypometabolism in the left cingulate gyrus, cuneus, posterior cingulate, and superior parietal lobule (BA 31, 18, 23, 7; figure 6), whereas MCI-FTD presented significant hypometabolic clusters in bilateral caudate, cingulate gyri, superior and inferior frontal gyri and left insula (BA 23, 10, 44, 45, 47, 13; figure 7).

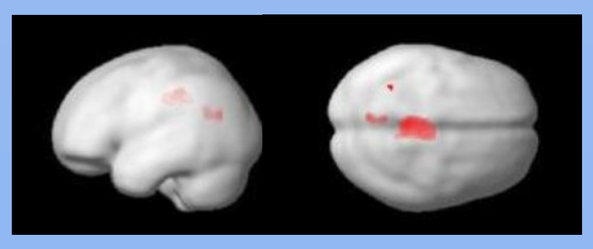

Figure 6

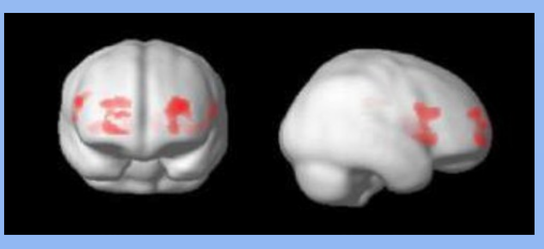

Figure 7

CONCLUSIONS

➢Patterns of hypometabolism revealed by FDG-PET in MCI-AD patients and FTD-MCI patients compared with stable MCI, may represent valid neuroimaging early biomarkers of progression to different dementia variants even in the prodromal phase of the disorder.

➢FDG-PET may be considered a valid tool able to provide predictors of evolution to dementia already in the earliest phases of the disorder, and to differentiate various forms of neurodegenerative diseases in their prodromal phase.

References

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