

BIOMARKERS (NON-NEUROIMAGING)

A machine learning model to predict progression from subjective cognitive decline to mild cognitive impairment and dementia: a 12-year follow-up study

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Abstract

Background: Subjective cognitive decline (SCD) represents a target population to be screened for dementia. Previous studies identified demographic, cognitive and generic features associated with higher risk of progression to mild cognitive impairment (MCI) and Alzheimer's disease (AD). We aim to test the accuracy of a machine learning model, trained on features derived from non-invasive and easily accessible techniques, in predicting conversion from SCD to MCI and AD.

Method: We included 150 SCD patients who underwent neuropsychological examination, assessment of cognitive complaint, mood disorders and cognitive reserve, APOE genotyping at baseline. All the patients underwent clinical-neuropsychological follow-up every 12-24 months for a mean time of 12 years.

Result: During follow-up, 63 patients were classified as progressive SCD (p-SCD, 42.0% [95% C.I. = 34.1:49.9], including 41 MCI (27.3% [95% C.I. = 20.2:34.5]) and 22 AD (14.7% [95% C.I. = 9.0:20.3]). 87 patients were classified as non-progressive SCD (np-SCD, 58.0% [95% C.I. = 50.1:65.9]). We split the whole sample into a training (80%) and a test group (20%). A gradient boosted trees algorithm was trained on 15 selected features including: age, APOE, education, test assessing for global cognition, immediate and delayed verbal, ecological memory and working memory, language, visuospatial abilities, phonemic fluency and cognitive reserve (Fig.1). This model showed a good accuracy (0.83, AUC = 0.78) in distinguishing p-SCD and np-SCD in the test group (Fig.2 and Fig.3).

Conclusion: Our machine learning models might represent a reliable, cost-effective and globally scalable tool for a first step screening of SCD patients before confirmation of AD pathology via more invasive and expensive tests.



