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A new diagnostic tool for dementia diseases

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A new diagnostic tool helps clinicians to differentiate between Alzheimer's disease, frontotemporal dementia and mild cognitive impairment. Presented in the doctoral thesis of MD Miguel Ángel Muñoz Ruiz at the University of Eastern Finland, the new method consists of a Disease State Index combining data from multiple sources, and of a Disease State Fingerprint showing the findings in a visual format.

It is estimated that more than 35.6 million people were living with dementia worldwide in 2010. This number will increase in the coming years and there is a need to identify these patients to provide them with proper treatment and care from the very beginning of the disease.

The differential diagnosis of the dementia diseases represents a challenge particularly in the early phases. Many studies have focused on predicting the possible conversion from mild cognitive impairment, a pre-dementia stage, to Alzheimer's disease (AD), the most common dementia disease. Several methods have also been proposed for differentiating between AD and frontotemporal dementia (FTD), another relatively common degenerative dementia. An early and precise diagnosis of these two dementia diseases is needed in order to benefit from treatments designed to influence the disease mechanisms.

In the recent years, important advances have been made especially in the development of new diagnostic methods. Several biomarkers and tests are used in the clinical practice, such as cerebrospinal fluid biomarkers, imaging methods, genetic profiling and neuropsychological tests.

However, making a differential diagnosis is not easy due to overlapping clinical and biomarker findings and the unavoidable subjective component when a clinician interprets all this multitude of data. Furthermore, there is no single biomarker or test which could clearly define whether a patient is suffering from AD or FTD.

The thesis of Dr Muñoz Ruiz introduces a new combination of different methods for the differential diagnosis of AD, mild cognitive impairment and FTD, and describes a tool comprising a Disease State Index and its visual counterpart, a Disease State Fingerprint.

The Disease State Index encompasses all the data from multiple sources while taking into account the most relevant method or test, and the Disease State Fingerprint shows the findings in an easy-to-interpret visual format.

The software combines data from multiple sources such as psychological tests and brain MRI, and uses this data to create a Disease State Index. The index is a numerical value between 0 and 1. In a healthy person, the index is close to 0, while an index close to 1 is an indicator of a dementia disease. The Disease State Fingerprint shows the findings in an easy-to-interpret format in which the key findings are clearly indicated by colour and size.

With the help of the new diagnostic tool, clinicians could know which methods are more relevant for profiling a patient with a certain dementia disease, i.e. whether it is mild cognitive impairment, FTD or AD, and already at the first visit, the clinician could make a first diagnosis for starting treatment and giving counselling to the patient.

More information: "Structural MRI in Frontotemporal Dementia: Comparisons between Hippocampal volumetry," Tensor-based morphometry and Voxel-based morphometry. *PLoS ONE* 7(12): e52531.

"Disease Fingerprint in frontotemporal degeneration with reference to Alzheimer's disease and mild cognitive impairment." *J Alzheimers Dis*. 2013 Jan 1;35(4):727-39. DOI: 10.3233/JAD-122260.