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MRI Lateralization Index of Hippocampal Subfields Could Characterize Progression of Mild Cognitive Impairment to Alzheimer's Disease

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A plethora of neuroimaging studies reported significant asymmetry of hippocampus in Alzheimer's disease (AD), indicating that difference in volumes between left and right exists and varies with disease progression. However, few works investigated whether asymmetries of hippocampi could characterize the conversion of Mild Cognitive Impairment (MCI) to AD. Thus, aim of the present work was to evaluate the Lateralization Index (LI) of hippocampal substructures as MRI biomarker for differentiating stable (sMCI) from progressive MCI (pMCI). Two-hundred subjects were selected from ADNI, 100 sMCI (72.2 yrs, MMSE 28) and 100 pMCI (72.4 yrs, MMSE 27.3). The structural baseline T1s were processed with FreeSurfer 6.0 and volumes of hippocampi+12 subfields were extracted. Paired t-test was used for assessing significant differences between left and right, separately for sMCI and pMCI. The LI was calculated as the absolute value of: ((Left-Right)/(Left+Right))*100. ANOVA adjusted for age, gender and intracranial volume was used for evaluating significant LI differences between sMCI and pMCI. The statistical threshold was Bonferroni corrected $p<0.05/13=0.0038$. Both sMCI and pMCI had rightward asymmetries (right>left) in WH, CA1, CA3, CA4, GC_ML_DG, tail and HATA, and leftward (left>right) in presubiculum, while a rightward was found only in fissure and molecular layer of sMCI. The magnitude of LI was about 50% higher in pMCI than sMCI in the WH, subiculum and molecular layer. These preliminary findings showed that hippocampal LI may be an early biomarker and that patients with stronger degree of asymmetry in these substructures had an increased risk of converting into AD.

Biography:

Alessia Sarica is currently a Post-doc Research-Fellow at Neuroscience Research Center, Department of Medical and Surgical Sciences, Magna-Graecia University of Catanzaro, Italy. She ownsa PhD in Biomedical and Computer Science Engineering and her research interests are on knowledge discovery from Neuroimaging, pattern-recognition and machine-learning. She has wide expertise in Random Forest and presented a systematic review about it for the prediction of Dementia (Sarica et al., 2017). She was the organizer and Special Guest Editor of a special issue on Journal of Neuroscience Methods:"A Machine learning neuroimaging challenge for automated diagnosis of Mild Cognitive Impairment" (Sarica et al., 2018).