Correlation between Global severity Scales in Cognitive impairment (GDS and CDR) and Magnetic Resonance H1 Spectroscopy, Perfusion Weighed Imaging and Diffusion Weighted Imaging

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INTRODUCTION: Some previous research in patients with mild cognitive impairment (MCI) and Alzheimer disease (AD) have probed changes in the results of Magnetic Resonance H^1 Spectroscopy (MRS), Perfusion Weighted Imagine (PWI) and Diffusion Weighted Imaging (DWI).The purpose of this study was to correlate the results of PWI, DWI and MRS with the results of two global severity scales in cognitive impairment: The Clinical Dementia Rating (CDR) and the Global Deterioration Scale (GDS).

PATIENTS AND METHODS: We evaluated 87 with cognitive impairment of diverse grade (35 men and 52 women; mean of age 70.2 $\pm$ 8.5 years old). All the patients were evaluated by a neurological team in our hospital. They applied both Global Severity Scales (GDS and CDR) and referred the patients to our diagnostic imaging department to make a cerebral Magnetic Resonance Imaging study and studies of DWI, PWI and MRS. We excluded patients with history of Parkinson´s disease, Fronto-temporal dementia, cerebrovascular disease, intracranial tumors, hydrocephaly, epilepsy, alcoholism, and psychiatric disorders. MSR was done in the left Occipital Lobe (LOL) and in the Posterior Cingulated gyri (PCG). The evaluated metabolites were N-Acetyl aspartate (NAA), Choline (Ch), Creatine (Cr) and myo-Inositol (mI). After getting DWI, we calculate Apparent Diffusion Coefficient (ADC) values in Region of Interest (ROI) located in hippocampi, White matter of temporal lobes, occipital lobes, parietal lobes, frontal lobes, and posterior cingulated gyri of both hemispheres. In PWI, we calculate the relative Cerebral Blood Volume (rCBV) in hippocampi, Gray matter of frontal lobes, occipital lobes, temporo-parietal regions, posterior cingulated gyri and somatic-sensorial cortex. We used Spearman coefficient to analyze the correlation between the different factors. Statistical analysis was made with SPSS 14 software.

RESULTS: We found 33 patients with AD and 54 with MCI. The Spearman coefficient had statistical significance in the correlation of GDS and CDR (R= 0.77, R^2 = 0,596, p<0,001). MRS showed a good correlation between ratios of NAA/Cr and NAA/mI with CDR and GDS in both evaluated regions and a weak correlation between Cho/Cr in the left occipital lobe and GDS. In DWI, we found a weak correlation between GDS and ADC values in hippocampi, temporal lobes, left frontal lobe and left occipital lobe. Finally, Perfusion showed a weak correlation between GDS and rCBV in occipital lobes and posterior cingulated gyri.

Table 1: Summary of significance statistical results correlating CGS, CDR and MR

Correlation	CDR		GDS	
	R2	P	R2	P
MRS LOL NAA/Cr	0,199	0	0,165	0
MRS LOL Ch/Cr	0,034	0,09	0,039	0,032
MRS LOL NAA/Mi	0,114	0,001	0,087	0,001
MRS PCG NAA/Cr	0,196	0	0,289	0
MRS PCG NAA/mI	0,093	0,004	0,128	0
rCBV Right Occipital Cortex	0,004	0,525	0,045	0,041
rCBV Left Occipital	0,005	0,446	0,062	0,025
rCBV Right Cingulated Gyrus	0,028	0,078	0,079	0,011
rCBV Left Cingulated Gyrus	0,008	0,345	0,069	0,018
ADC Right Hippocamous	0,011	0,334	0,082	0,007
ADC Left Hippocampus	0,006	0,463	0,07	0,013
ADC Right Temporal Lobe	0,007	0,446	0,092	0,004
ADC Left Temporal Lobe	0,006	0,476	0,072	0,012
ADC Left Occipital lobe	0,016	0,246	0,05	0,038
ADC Left Frontal Lobe	0	0,925	0,046	0,045

CONCLUSIONS: In patients with cognitive impairment, there is a good correlation between GDS and CDR. The closest tool to make correlation with the clinical scales (GDS and CDR) is MRS in both studied areas. PWI and DWI are tools with a weak correlation with clinical scales, being GDS the unique that gave us significance statistical results, this could be explained by the major number of items considered for MCI (GDS 2 and 3) compared to CDR (CDR 0,5). MRS can be used in the diagnostic, following and evaluation of the response to the treatment in patients with cognitive impairment (MCI and AD), complementing the information obtained in the clinical evaluation.