Evaluation of cerebral hemodynamics with microbubble enhanced ultrasound imaging and magnetic resonance imaging in MS patients

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Multiple sclerosis is the most common disease of the Cerebral nervous System that affects young adults and causes severe neurological disability. Based on strong scientific evidence it is currently considered an auto-immune organ-specific but seems unlikely to be the result of a single causal event. The disease is characterized by a profound pathological, clinical and neuroradiological heterogeneity. It 's likely that there is a single cause of disease but that it is the result of a complex interaction of factors that act with different intensity in different individuals and in different stages of the disease. Among the many factors that could determine brain damage, scientific evidences indicate ischemic changes, changes in venous outflow, accumulation of neurotoxic and pro-inflammatory substances.

Patients with MS have higher frequency of ischemic stroke and perfusion abnormalities were detected in both early and advanced stages of disease. The study of cerebral venous return is very difficult for the complex anatomical and physiological variables that come into play simultaneously. We will show the results of research carried out on patients with MS, as a model of autoimmune disease, and patients with Amytrophic Lateral Sclerosis (ALS), as a model of neurodegenerative disease, compared to a group of healthy subjects.

Moreover, we evaluated the genetic susceptibility of vascular changes in MS and ALS, using a DNA bank of the Research Unit of the Department of Neurology, Federico II University and assaying serum levels of homocysteine, prothrombotic factors, oxygen free radicals and endothelial factors (autoimmune and proangiogenetici). We also tested the association between the C677T polymorphism of methylenetetrahydrofolate reductase, and the allelic variation in two different genes responsible for the angiogenic factors VEGF-A and HIF1A and micro and macro vascular abnormalities in MS and ALS. Changes in brain arterial perfusion and transit time were studied using contrast-enhanced Perfusion-weighted MRI, while magnetic susceptibility MRI was employed to assess the state of deep cerebral venous outflow through visualization and analysis of the intracranial venous system, and to measure intracerebral iron deposits in specific locations (basal ganglia).

The morphology and haemodynamics of extracranial and intracranial vessels were evaluated using the measurement of intima-media thickness of carotid artery walls, echo-color Doppler intra-and extracranial cerebral venous district, and measurement of cerebral arterio-venous transit time with contrast-enhanced ultrasound.

The results of the ultrasound-based imaging modalities of the intra and extracranial district were compared with the alterations of cerebral perfusion and iron deposits studied with MRI and the biochemical and genetic markers of vascular risk.

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Dr. Mancini has nothing to disclose nor any conflicts of interests to declare.