

Investigation of cerebral blood flow in Multiple Sclerosis with arterial spin labeling MRI

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MS is a demyelinating inflammatory disorder of the CNS; however, vascular involvement and perfusion abnormalities are recently receiving an increasing interest. Earlier PET and SPECT studies showed perfusion deficits in cognitively impaired MS patients. Arterial spin labeling (ASL) is a noninvasive technique that can measure cerebral blood flow (CBF). ASL measures CBF by taking advantage of arterial water as a freely diffusible tracer, avoiding the need for gadolinium or radioactive ligands; thus, ASL would be a noninvasive and repeatable method of measuring CBF. The ASL technique could be used in place of dynamic susceptibility contrast, PET and SPECT for the examination of neurologic disorders.

Decreased CBF has been demonstrated in both normal appearing WM (NAWM) and deep GM in relapsing-remitting MS (RRMS) patients. Interestingly, NAWM had more reduction of CBF in primary-progressive MS compared to RRMS. A regional increase of CBF has been detected in early lesion stages, up to 3 weeks prior to brain-blood barrier (BBB) breakdown with subsequent contrast enhancement.

Interestingly, a reduction of GM CBF measured by ASL was confirmed in all MS patients compared to healthy controls. cerebral vasoreactivity (CVR) was found diminished in MS patients compared to healthy controls indicating an impaired CBF regulation. it was hypothesized that the impaired CBF regulation may cause neurodegeneration due to an insufficient blood supply. the study of both perfusion and diffusion tensor imaging supported the concept of primary ischemia in MS. regional CBF by ASL has been correlated with clinical measures in MS patients. It is known that the NAWM and GM manifest a constant, low-grade inflammation, which could lead to a venular vasodilation with slowing, reduced perfusion.

ASL perfusion MRI could provide a new potential outcome measures especially in progressive MS characterized by a more severe decrease in CBF and by a decrease of both Gd-enhanced or new/enlarged T2-weighted lesions and provide a more comprehensive measure of inflammation in RRMS.

Keywords : Cerebral blood flow, perfusion, Multiple Sclerosis, arterial spin labeling MRI .