Editorial for "MRI Assessment of Cerebral Blood Flow in Non-Hospitalized Adults Who Self-Isolated Due to COVID-19"

Neurological manifestations are well recognized in patients with COVID-19, with inflammation and damage to the brain vasculature being the common neuroimaging findings.[1] A considerable number of individuals continue to experience—or even develop secondarily—neurological symptoms such as cognitive impairment (2.2% of individuals after SARS-CoV-2 infection) and fatigue or mood swings (3.2%) lasting up to several months after the recovery from COVID-19.[2] This condition is commonly referred to as "long COVID" or "post-COVID condition," and it creates a substantial burden for social networks, health care, and economics beyond the personal suffering of the patient.[3] Understanding the pathophysiological mechanisms of the condition plays a pivotal role in the quest for treatment approaches. Neuroimaging is a key diagnostic technique in this process.

An interesting neuroimaging method potentially sensitive to the long-term effects of COVID-19 is MRI perfusion measurement with arterial spin labeling (ASL). Previously, ASL was employed in applications assessing cognitive decline related to microvascular damage and neuroinflammation in the context of cancer therapy or dementia. In these cases, ASL was able to document longitudinal perfusion decrease following radiochemotherapy[4] or to help to detect changes in severe Alzheimer's disease and even in the prodromal stage.[5]

The use of ASL perfusion MRI to measure acute and chronic effects of COVID-19 remains limited. ASL was used to demonstrate that a post-COVID olfactory dysfunction was associated with lower tissue perfusion in the orbital and medial frontal regions.[6] ASL also showed decreased perfusion in hospitalized subjects with severe disease 3 months after discharge.[7] However, perfusion still needs to be systematically studied in the largest group of individuals that underwent COVID-19 but did not require hospitalization.

In this issue of *JMRI*, an article by Kim et al provides new results in a cross-sectional ASL study of 39 subjects who self-isolated at home due to COVID-19 and were scanned on average 4 months after the positive test.[8] Typically, CBF measured with ASL have a relatively large intrasubject variability due to instrumental issues and physiological confounders. In theory, CBF could be influenced by various physiological and psychological factors related to contracting an infectious disease other than COVID-19. To address this, the authors have included a control group of 11 subjects who experienced flu-like symptoms but tested negative for COVID-19. Decreased perfusion in the COVID-19 group relative to the control group was found in several brain regions, including the basal ganglia, thalami, and orbitofrontal gyri. Further differences were discovered between COVID-19 subgroups with and without fatigue.

Despite the smaller size of this study, it backs findings from the UK Biobank study, which have demonstrated gray matter tissue loss in the orbitofrontal cortex and whole brain and higher cognitive decline longitudinally in participants infected with SARS-CoV-2.[9] Further population studies are currently being conducted,[10] and the presented study by Kim et al indicated the value ASL could have to provide quantifiable perfusion information.

Limitations of the study are a lack of pre-COVID baseline measurements and long-term outcomes of the post-COVID symptoms. In addition, the limited sample size did not allow more detailed subgroup analyses. However, showing a correlation between severity and worsened perfusion compared with patients recovering from a non-COVID flu-like respiratory illness is a step in the right direction in shedding light on the long-term effects of COVID-19 on brain perfusion.

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Technical Efficacy: Stage 1