Radiology

Manuscript type: Letter to the Editor

Neurological Involvement of COVID-19 Patients: Making the Most of MRI

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***Editor*:**

We read with interest the recent article by Mahammedi et al[1], describing a spectrum of neuroimaging features of patients positive for COVID-19 on CT and MRI. There was a pressing need for a useful study such as this reporting on the largest patient population to date with neurological symptoms due to COVID-19. None of their cases showed abnormal parenchymal or leptomeningeal enhancement, although half (10/20) of the patients who underwent brain MRI had post-contrast imaging.

In contrast, Helms et al[2] reported leptomeningeal enhancement on MRI in 62% of their patients. Critically, Helms et al. performed both three dimensional fluid attenuation inversion recovery (3D FLAIR) and 3D T1-weighted (3DT1WI) sequences after Gadolinium injection. In their supplemental figures[2], foci of abnormal leptomeningeal enchancement were most clearly demonstrated on the contrast-enhanced FLAIR sequence rather than the unenhanced FLAIR or T1-weighted post-contrast sequences.

In our practice, leptomeningeal enhancement appears to be a common feature in COVID-19 patients with neurological symptoms. We noticed that such abnormalities are usually not visible using CT alone, noncontrast brain MRI or even post-gadolinium 3D T1WI. Conversely,

adding a post-contrast 3D FLAIR sequence for suspected cases of COVID-19 improves the conspicuity of abnormalities in the leptomeningeal compartment.

The value of contrast-enhanced FLAIR for the detection of leptomeningeal enhancement is well-established and considered up to 4-fold more sensitive than T1-weighted imaging for the detection of low concentrations of contrast in CSF.[3] This superiority has been demonstrated in diseases such as meningeal carcinomatosis[4] and Susac's syndrome[5]. Furthermore, performing FLAIR in 3D allows good suppression of CSF in normal areas, increasing the contrast with potential leptomeningeal abnormalities.

We hypothesize that the low rate of leptomeningeal abnormalities in the study by Mahammedi et al. may be due to the lack of contrast-enhanced FLAIR sequence, which is not the standard of care in many institutions.

In conclusion, we advocate the integration of a post-contrast 3D FLAIR sequence to brain MRI protocols for the investigation of COVID-19 patients presenting with any neurological symptom, including confusion and headaches.

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