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Beyond the *AJR:* Cardiac PET/MRI for the Assessment of Myocardial Injury After COVID-19

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Summary of the Investigation

Hanneman et al. investigated changes in myocardial metabolism and patterns of myocardial inflammation in 47 patients recently recovered from COVID-19 using cardiac FDG PET/MRI [1]. Participants underwent PET/MRI at a mean of 67±16 days after COVID-19 diagnosis, with most participants having recovered at home from the acute infection. A total of 19/47 (40%) participants had at least one abnormal finding on cardiac PET/MRI, including alterations in parameters such as FDG uptake, ejection fraction, and regional T2 or T1 relaxation times, as well as visible late gadolinium enhancement (LGE). These included 15 (32%) participants with non-ischemic LGE lesions at midmyocardial or subepicardial locations, and 8 (17%) participants with abnormal FDG uptake (focal or focal-on-diffuse pattern in all cases). In two participants, focal FDG uptake was the only imaging abnormality. FDG-positive examinations, when compared to FDG-negative examinations, had elevated regional T1 (1271 vs 1238 ms, p=.001) and T2 relaxation times (44 vs 40 ms, p <.001), were more likely to have associated LGE findings (6/8 [75%] vs 9/39 [23%], p=.009), and had higher systemic inflammatory blood markers (e.g., interleukin 6, interleukin 8, and C-reactive protein). Cardiac symptom burden did not differ between groups. FDG findings resolved in most instances on follow-up PET performed after two months.

Critical Analysis

Multiple investigations report signs of myocardial injury after COVID-19 on cardiac MRI, with a prevalence ranging from 7-78% [2, 3]. This study provides further insight into the manifestations of myocardial injury after COVID-19 through evaluation by FDG PET/MRI. Limitations of this study, including a potential selection bias (i.e., 47 patients recruited among 1263 invited by mail) and possible false-positive PET/MRI interpretations due to insufficient myocardial glucose suppression, overall seem minor.

The focal FDG uptake in eight participants provides evidence of persistent active myocardial inflammation following recent recovery from COVID-19. The presence of abnormal FDG uptake partially refutes the theory that many cardiac abnormalities detected on MRI in patients with COVID-19 may have been preexisting. Most participants with FDG-positive examinations recovered at home, and none were treated in the ICU, suggesting that severity of COVID-19 may not play a significant role in the development of myocardial inflammation. Further, participants with FDG-positive examinations had regionally increased T1 and T2 relaxation times. This finding highlights the importance of myocardial T1 and T2 mapping for the detection of acute myocardial inflammation after COVID-19, serving as potentially useful markers for the detection of diffuse and focal myocardial edema even in subclinical myocardial inflammation [4]. MRI (to facilitate T1 and T2 mapping) is more widely available and lacks the ionizing radiation associated with PET. Nonetheless, this study also showcases the potential benefit of PET, as two patients with FDG uptake failed to demonstrate any abnormal MRI findings.

Although the study suggests spontaneous resolution of COVID-19-associated active myocardial inflammation, concern is warranted regarding the 32% of participants who demonstrated non-

ischemic LGE lesions. Cardiac scarring on MRI is associated with an increased risk of cardiovascular disease, worse clinical outcomes, and, in patients recovered from myocarditis, may be associated with ventricular arrhythmias and sudden cardiac arrest even in the setting of normal or near-normal left ventricular function [5].

Takeaway Point

Patients recovered from COVID-19 have distinct abnormalities on cardiac PET/MRI, including patterns of myocardial scarring and inflammation. Focal elevations in T1 and T2 relaxation times may represent ongoing inflammation. The findings demonstrate the possible role of cardiac MRI in evaluating COVID-19-induced myocardial tissue injury, including for purposes of post-recovery cardiac surveillance, guidance of return to activity, and long-term cardiovascular risk assessment.

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