

# FDG PET/MRI of Acute Myocarditis After mRNA COVID-19 Vaccination

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**Abstract:** A 22-year-old man visited the emergency department with chest pain. He had received a second dose of the coronavirus disease 2019 (COVID-19) mRNA (Moderna) vaccine 5 days prior. <sup>18</sup>F-FDG PET/MR revealed a focal FDG uptake and late gadolinium enhancement on the basal posterolateral wall of the left ventricle. Myocarditis after a COVID-19 vaccination has been reported predominantly after the second dose of mRNA vaccines in young men. This was a case of acute focal myocarditis after a COVID-19 mRNA vaccination, which was well-visualized by FDG PET/MRI.

**Key Words:** COVID-19, vaccine, myocarditis, PET/MR

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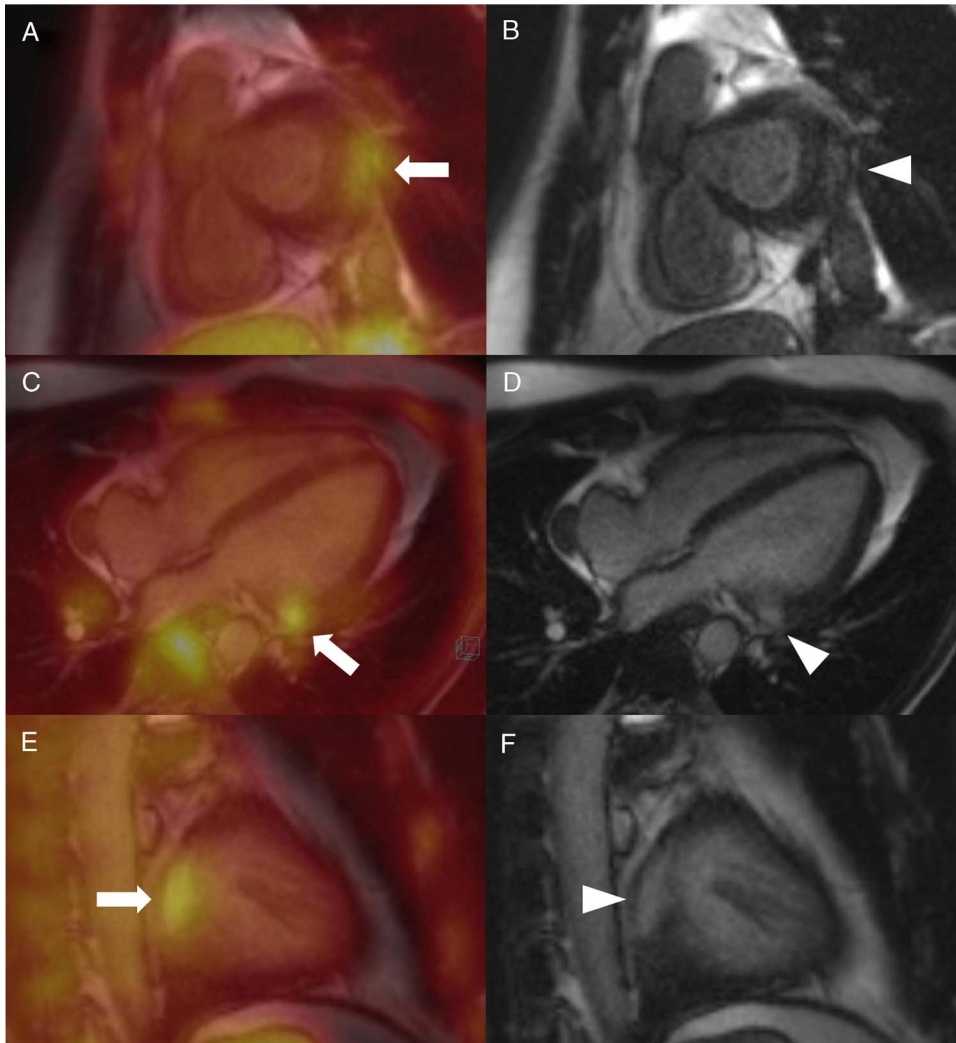
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**FIGURE 1.** A 22-year-old man visited the emergency department with chest pain. He had received a second dose of the coronavirus disease 2019 (COVID-19) mRNA (Moderna) vaccine 5 days prior. His cardiac troponin I was elevated to 5.99 ng/mL (reference range, 0–0.04 ng/mL). A polymerase chain reaction test for COVID-19 exhibited negative results. Electrocardiography revealed ST-segment depression and T-wave inversion in leads V1–4. Echocardiography revealed a normal left ventricular systolic function without any pericardial effusion.  $^{18}\text{F}$ -FDG PET/MR was performed after careful patient preparation with a low carbohydrate diet followed by a 12-hour fasting.<sup>1</sup> That revealed a focal FDG uptake ( $\text{SUV}_{\text{max}}$ , 2.12; arrows) and subepicardial late gadolinium enhancement (LGE, arrowheads) on the basal posterolateral wall of the left ventricle. Both FDG PET and LGE were concordant, suggesting focal myocardial inflammation. Fused FDG PET with LGE (A, C, E) and LGE (B, D, F) images. His symptoms and troponin I level improved with a nonsteroidal anti-inflammatory drug, and he was discharged without any symptoms on the fifth hospital day. Myocarditis after a COVID-19 vaccination has been reported predominantly in young men, and more commonly after a second dose of mRNA vaccines due to a stronger immune response as compared with the first dose.<sup>2–6</sup> Potential mechanisms of COVID-19 mRNA vaccine myocarditis include autoimmune and autoinflammatory responses,<sup>2,7,8</sup> autoantibody generation,<sup>9</sup> and molecular mimicry between the viral spike protein and self-antigens.<sup>10,11</sup> The electrocardiography changes including ST depression in the precordial leads were presumed to be reciprocal changes of the ST elevation associated with the posterior wall injury of the left ventricle. This was a case of acute focal myocarditis after a COVID-19 mRNA vaccination, which was well-visualized by FDG PET/MRI.