

# Systemic Vasculitis Following SARS-CoV-2 mRNA Vaccination Demonstrated on FDG PET/CT

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**Abstract:** Causality regarding adverse events following SARS-CoV-2 mRNA vaccine is undetermined for vasculitis. Herein, we report the case of an 80-year-old man who presented with a persistent high fever of 7 days' duration that began shortly after receiving a COVID-19 vaccination. There was also a complaint of persistent lower limb pain and walking difficulty on emergency transportation. FDG PET/CT demonstrated extensive linear hypermetabolic foci along the vessels of both legs, including the hips, and the arms, supraclavicular area, chest wall, and temporal regions, suggesting systemic vasculitis. Subsequent temporal artery biopsy revealed arteritis, which is not typical of giant cell arteritis.

**Key Words:** COVID-19, FDG PET, mRNA, SARS-CoV-2, vaccine, vasculitis

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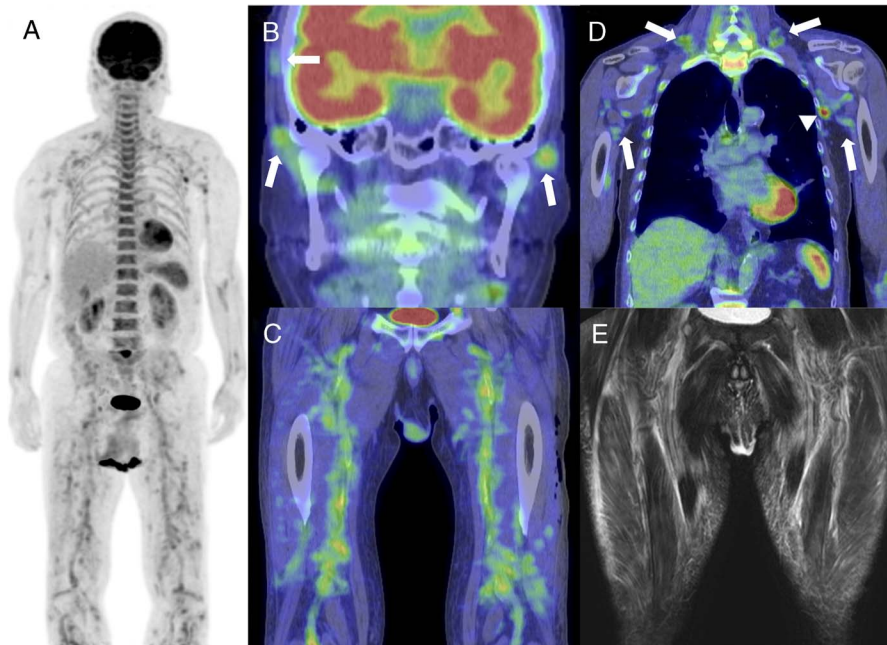
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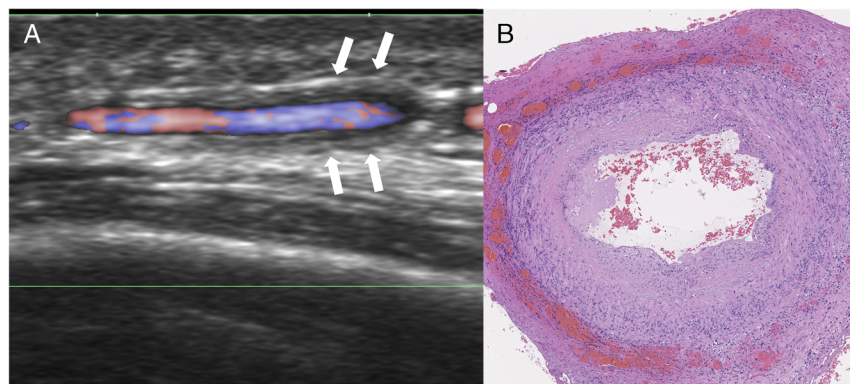
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**FIGURE 1.** An 80-year-old man was referred to our emergency room owing to a high fever lasting 7 days, with walking difficulty. He had received a second SARS-CoV-2 mRNA vaccination 1 week earlier, and the onset of fever  $>39^{\circ}\text{C}$  began the day after the vaccination. He also had persistent lower extremity pain beginning 3 days after immunization. Laboratory data at admission were as follows: white blood cell count, 17,300 cells/ $\mu\text{L}$ ; lactate dehydrogenase, 662 U/L; and C-reactive protein, 31.9 mg/dL. He underwent FDG PET/CT to identify an inflammatory focus. Extensive linear and patchy hypermetabolic foci along the major vessels and their branches, including medium-sized arteries, such as the muscular or distributing arteries, were observed in both legs and hips (A: MIP, C: coronal fusion), arms, supraclavicular area, chest wall (D, arrow), and temporal regions (B, arrow). Left axillary node swelling after vaccination was also observed (D, arrowhead). Femoral MRI (E) was performed because subcutaneous panniculitis was initially considered a differential diagnosis. High-intensity signals in the artery wall and perivascular connective tissues were observed mainly in the quadriceps muscles, suggesting lower limb vasculitis or small vessel vasculitis. However, muscle biopsy failed to show pathognomonic findings. The utility of FDG PET/CT in large vessel vasculitis (i.e., Takayasu arteritis and giant cell arteritis [GCA]) has been established.<sup>1,2</sup> However, the characteristics in this case differed from the characteristics of Takayasu arteritis and GCA; no significant accumulation or vessel wall thickening was observed in the aortic wall and its major branches (A). The findings in our case resembled the “ant farm”-like appearance reported with restricted lower vasculitis.<sup>3</sup> Muscle biopsies are not absolute, when determining a vasculitis diagnosis, and false-negative results are not uncommon. Interestingly, this case had a more extensive anatomical range of abnormalities, such as the temporal regions and part of the trunk.



**FIGURE 2.** There was abnormal FDG uptake in the temporal artery, which was the region where the patient complained of a headache. Accordingly, ultrasonography of the temporal arteries (A) was performed. Arterial wall thickening was observed (arrows), but it was brighter than the typical “dark halo” sign of GCA. Subsequently, temporal artery biopsy (B) was performed. Histological examination revealed neutrophil and lymphocyte infiltration mainly on the internal and external elastic plates where some of the vascular wall structure had been markedly destroyed; however, no giant cell formation was observed. These findings were not suggestive of GCA, but rather of an acute onset of unexplained systemic vasculitis. It has become clear that COVID-19 can affect any organ, including the circulatory system, and COVID-19–associated vasculitis is a specific feature of virus-induced systemic disease.<sup>4</sup> There are anecdotal reports that vasculitis occurred following COVID-19 mRNA vaccination.<sup>5–8</sup> However, no causal relationship was identified in any of the reports, and there is no consistency regarding the characteristics of the reported cases. In the present case, as well, it cannot be ruled out that preexisting asymptomatic vasculitis might have coincidentally worsened after vaccination. Therefore, we must remain cautious regarding concluding a causal relationship between systemic vasculitis and the COVID-19 vaccine. Nevertheless, FDG PET helps to assess the characteristic distribution to make a differential diagnosis of vasculitis.