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IMAGE–CARDIOLOGY

Three-dimensional transthoracic echocardiography successfully identified myocardial trabeculation mimicking left ventricular apical thrombus in a patient with COVID-19

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A 58-year-old man had a 5-day history of high fever and cough. He suffered from hypoxia, and chest computed tomography (CT) showed multiple pulmonary ground-glass opacities bilaterally (Fig. 1a). He was diagnosed with coronavirus disease 2019 (COVID-19) and admitted to our hospital. Electrocardiogram showed pathological Q waves, ST-segment elevation, and inverted T waves in precordial leads (Fig. 1b), suggesting anteroseptal myocardial infarction (MI), whereas he never had chest pain. Transthoracic echocardiography (TTE) revealed an akinetic anteroseptal wall and a left ventricular (LV) apical aneurysm. In addition, an isoechoic immobile mass, suspected of being a mural thrombus, was visualized along the aneurysm (Fig. 1c; Videos 1, 2). Since COVID-19 induces hypercoagulability and cardiovascular inflammation with a variety of cardiac manifestations [1], we hypothesized that these cardiac abnormalities were associated with COVID-19. However, neither cardiac troponin nor D-dimer was elevated through the repetitive measurements, which was inconsistent with the assessment. He was hemodynamically stable and did not require emergent coronary angiogram. Coronary CT revealed not only severe stenosis of the proximal left anterior descending artery (LAD) but also a low-density mass compatible with a LV thrombus in the apical aneurysm (Fig. 1d). In addition to oxygenation, he was treated with favipiravir and dexamethasone for COVID-19 [2, 3], continuous heparin for the suspected LV thrombus, and antianginal drugs for MI. On day 5, the fever abated and hypoxia resolved. The additional ischemic electrocardiographic changes evoked by walking had him undergo revascularization for LAD (Fig. 1e, f). Anticoagulation with warfarin was continued for 3 months; however, the LV mass did not resolve (Video 3). Since cardiac magnetic resonance imaging was rejected due to claustrophobia, three-dimensional (3D) TTE was performed. The 3D apical view demonstrated trabecular formation crosslinking to septal and lateral walls, suggesting that the LV mass was myocardial trabeculation, not a thrombus (Fig. 1g; Videos 4–6); however, the possibility of a concomitant invisible tiny thrombus adjacent to the trabeculation remained. Regardless of a history of COVID-19, he previously developed silent MI, and the atypical LV trabeculation mimicked a LV thrombus. Since the TTE appearance of LV thrombi varies from case to case depending on thrombus age, morphology, and location, two-dimensional imaging has a certain limitation [4]. 3D TTE can be used as a complementary tool as it allows visualization of cardiac structures independent of the availability of specific acoustic windows [5]. In the present case, it allowed us to identify the mass as myocardial trabeculation and successfully resolve our misunderstanding.

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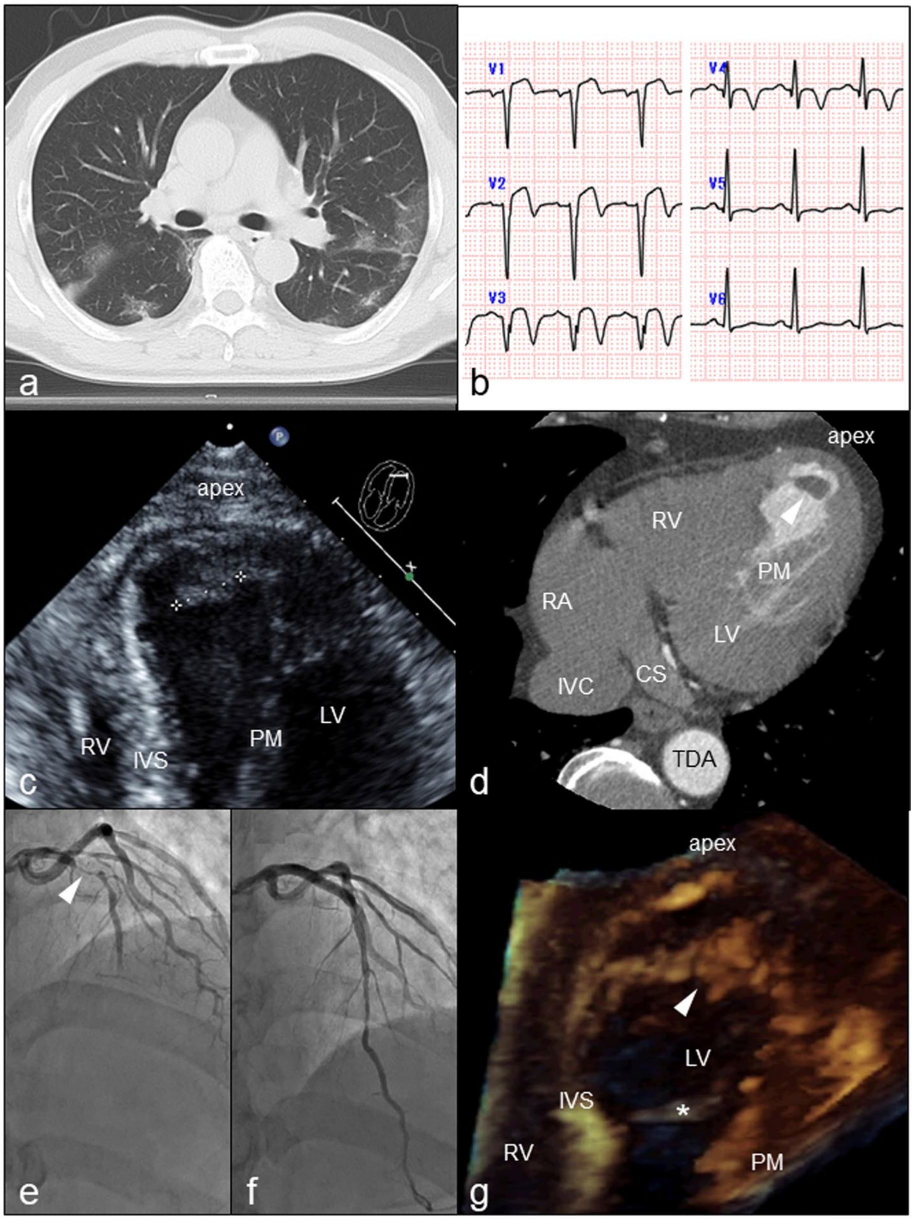

Fig. 1 **a** Chest computed tomography (CT) showed multiple pulmonary ground-glass opacities bilaterally. **b** Twelve-lead surface electrocardiogram (ECG) (25 mm/s, 10 mm/mV) demonstrated pathological Q waves, ST-segment elevation, and inverted T waves in precordial leads. Sinus tachycardia and mild left atrial enlargement were noted. **c** A zoomed two-dimensional (2D) apical transthoracic four-chamber view showed a thin left ventricular (LV) apex compatible with aneurysm formation. An isoechoic immobile mass with a long diameter (1.3 cm) (the dotted white line between the two white cross symbols) was visualized along the aneurysm. *LV* left ventricle, *RV* right ventricle, *IVS* interventricular septum, *PM* papillary muscle. **d** Cardiac contrast-enhanced CT showed a low-density mass (the white arrow head) along the apical aneurysm. *RA* right atrium, *IVC* inferior vena cava, *CS* coronary sinus, *TDA* thoracic descending artery. **e** Coronary angiogram showed severe stenosis of the proximal left anterior descending artery (LAD) (the white arrow head) with delayed coronary blood flow. **f** Coronary revascularization for LAD stenosis was performed by implanting an everolimus eluting coronary stent (4.0 × 23 mm), which improved coronary blood flow. **g** A zoomed apical transthoracic four-chamber view with full-volume three-dimensional (3D) image from an intercostal window using 4Q imaging mode with a X5 transducer (Philips® EPIQ™ system) showed myocardial trabeculation (the white arrow head) appearing forming crosslinking to septal and lateral walls. The white asterisk shows false tendons arising from the LV wall adjacent to the apical aneurysm

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Declarations

Conflict of interest Kei Takahashi, Toru Egashira, Toshimi Kageyama, Tetsuo Oumi, Shigeo Shimizu, Kazunori Moritani, and Hideo Mitamura declare that they have no conflicts of interest.

Ethical approval All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1964 and later versions. Informed consent was obtained in the form of an opt-out selection.

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