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MINI-FOCUS ISSUE: IMAGING

ADVANCED

IMAGING VIGNETTE: CLINICAL VIGNETTE

Multiple Etiologies to Myocardial Injury in COVID-19

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ABSTRACT

In patients with acute myocardial injury secondary to coronavirus disease-2019 (COVID-19), cardiovascular magnetic resonance imaging can identify the underlying pathology. We highlight a case of acute myocardial injury secondary to COVID-19, which demonstrated both epicardial vessel thrombosis and the recently described phenomenon of microvascular thrombosis. (**Level of Difficulty: Advanced.**) (J Am Coll Cardiol Case Rep 2021;3:971–2) © 2021 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

A fit and well 45-year-old man with no previous medical history presented to the emergency department with 2 h of central chest pain on a background of a 2-week history of coronavirus disease-2019 (COVID-19). On presentation, he was hemodynamically stable with blood pressure of 117/68 mm Hg and heart rate of 50 beats/min. Physical examination revealed diaphoresis, but was otherwise unremarkable. Immediate 12-lead electrocardiogram showed ST-segment elevation in the anterior leads. Although myocarditis was initially suspected, he proceeded to emergency coronary angiography, which revealed thrombotic occlusion of the distal left anterior descending coronary artery (**Figure 1A**, arrow) and fresh thrombus midvessel (**Figure 1A**, arrowhead). The left circumflex and right coronary artery were normal (**Figures 1B and 1C**, arrows). The thrombus was aspirated and treatment with glycoprotein IIb/IIIa inhibitor (tirofiban) initiated. Intracoronary optical coherence tomography excluded atherosclerosis or plaque-rupture in the left anterior descending coronary artery. A diagnosis of COVID-19-associated acute myocardial infarction was considered secondary to epicardial thrombotic occlusion.

Cardiac magnetic resonance imaging (CMR) performed 3 weeks later revealed a nondilated left ventricle with mild systolic impairment. There was septal hypokinesis at the midventricular to apical level. T_2 mapping revealed edema predominantly in the apical septum (**Figure 1D**, arrow). The late gadolinium enhancement images revealed extensive infarction in the apical septum and apical cap (**Figures 1E and 1F**, asterisks) as well as ischemic pattern late gadolinium enhancement at the inferoseptal junction and the apical lateral wall (**Figure 1E**, arrowheads). Additionally, there were areas of patchy subepicardial enhancement on the right ventricular side of the interventricular septum, consistent with possible microvascular thrombosis as recently described from postmortem studies (**Figures 1F and 1G**, arrows) (1). There was no clinical evidence of thrombotic complications elsewhere. The patient was treated with both an antiplatelet agent (clopidogrel) and an anticoagulant (rivaroxaban) and was discharged well.

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

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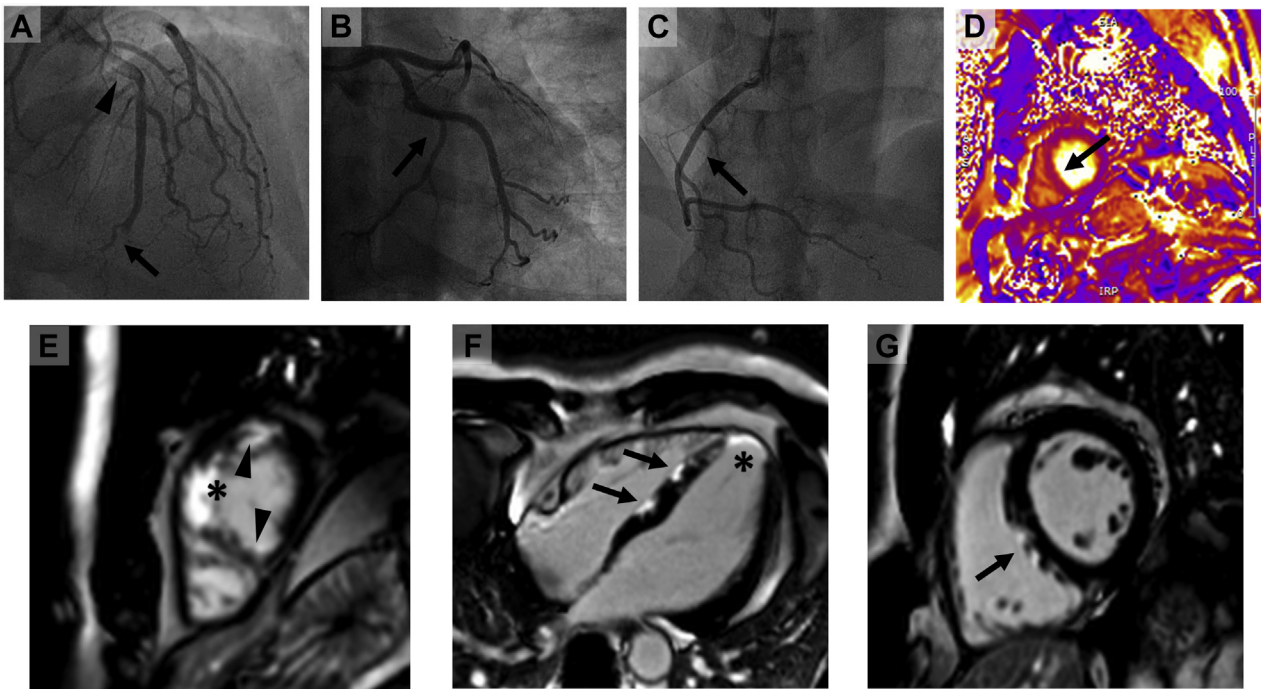
ABBREVIATIONS AND ACRONYMS

CMR = cardiac magnetic resonance imaging

COVID-19 = coronavirus-2019

This case highlights that cardiac magnetic resonance imaging can phenotype the multiple potential etiologies of acute myocardial injury in COVID-19, including myocarditis, pericarditis, myocardial infarction, and pro-thrombotic phenomena such as possible microvascular thrombosis.

FIGURE 1 Coronary Angiography and Cardiac MRI Images in COVID-19



(A) Distal occlusion of the left anterior descending coronary artery detected on coronary angiography **(arrow)** and fresh thrombus midvessel **(arrowhead)**. **(B)** Normal left circumflex artery **(arrow)** and **(C)** normal right coronary artery **(arrow)**. **(D)** T_2 map at apical level shows edema in the septum **(arrow)**. **(E)** Short-axis cardiac magnetic resonance imaging (CMR) late gadolinium enhancement image shows infarction in the apical septum **(asterisk)** as well as ischemic pattern late gadolinium enhancement (LGE) at the inferoseptal junction and the apical lateral wall **(arrowheads)**. **(F)** 4-chamber CMR LGE image shows infarction in the apical cap **(asterisk)** and patchy subepicardial enhancement in the interventricular septum **(arrows)**. **(G)** Short-axis CMR LGE images show patchy sub-epicardial enhancement in the interventricular septum **(arrow)**.

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