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Images in Cardiovascular Medicine

Myocarditis Mimicking Stress-Induced (Takotsubo) Cardiomyopathy

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A 27-year-old man with transfusion-dependent aplastic anemia was admitted with septic shock. A new-onset diffuse ST-segment elevation on electrocardiogram (ECG) and an up-trending high-sensitivity troponin T level, with a peak of 10,050 ng/mL on the fourth day of admission, were noted. No chest pain or risk factors for coronary artery disease (CAD) were present. Transthoracic echocardiography demonstrated moderate systolic dysfunction of the left ventricle (LV) with left ventricular ejection fraction (LVEF) of 30%. Akinesia of the apical, midseptal, and inferior segments was found (Fig. 1). Diffuse echocardiographic changes that did not indicate a specific coronary artery distribution and the presence of underlying septicemia raised concern for an inflammatory process, such as myopericarditis, rather than acute coronary syndrome. In addition, the patient had severe pancytopenia that precluded invasive angiography. Therefore, the patient was referred for cardiovascular magnetic resonance (CMR) imaging.

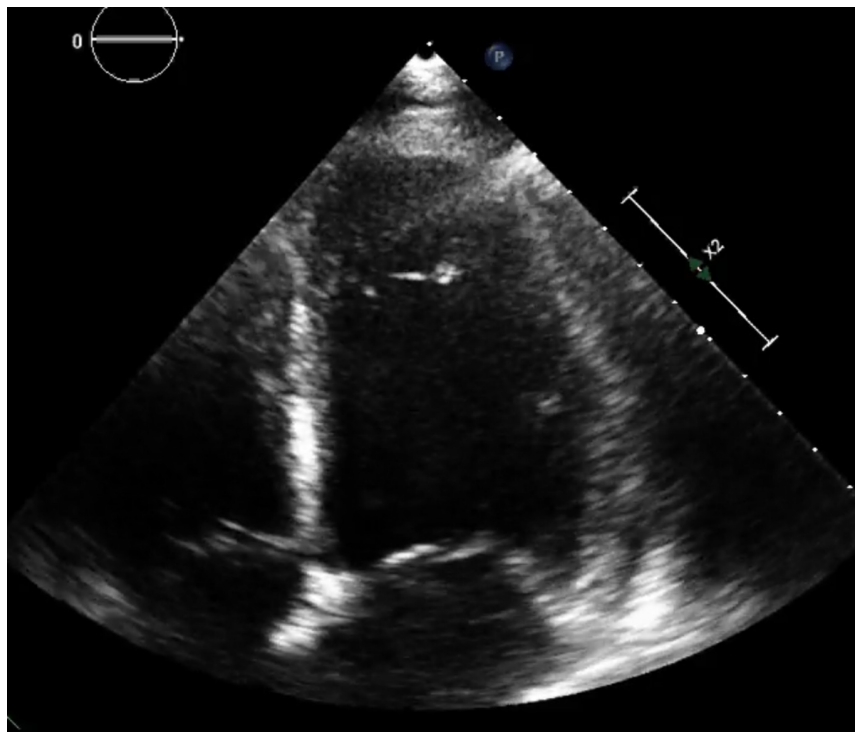

Fig. 1 *Apical 4-chamber view of echocardiogram with standard orientation (screen right is the left ventricle and screen left is the right ventricle). A trace posterobasal pericardial effusion and prominent left ventricular apical chord are visible. The supplemental video demonstrates hypokinesis of the basal and midinferoseptal left ventricular segments and akinesia of the apical inferoseptal and anterolateral left ventricle segments.*

A supplemental motion image is available for Figure 1.

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Cine CMR images revealed mild LV systolic dysfunction (LVEF, 40%). There was normal contraction of basal segments but akinesia of mid- and apical segments, in a pattern suggestive of stress-induced cardiomyopathy (Fig. 2 and Fig. 3). However, late gadolinium enhancement (LGE) images showed extensive subepicardial and midmyocardial enhancement in the akinetic segments (Fig. 4). Extracellular volume (37.1%) and T2 (68 ms) were elevated, indicative of myocardial edema in the affected segments. The imaging findings are consistent with acute myocarditis based on the 2018 Lake Louise criteria,[2] although the pattern of wall motion mimicked the appearance of Takotsubo cardiomyopathy.

Medical therapy was initiated for acute myocarditis and led to symptomatic relief. Two months later, CMR images were obtained because of recurring symptoms. Images demonstrated persistent LGE with mild improvement of global systolic function (LVEF, 44%). In addition, mild pericardial thickening and pericardial enhancement were noted and were indicative of pericarditis.

Comment

Infarct-like clinical symptoms without angiographic evidence of CAD could be caused by several different entities that are grouped under the term myocardial infarction with nonobstructive coronary arteries (MINOCA); myocarditis is the leading etiology.[1] Cardiovascular magnetic resonance imaging has become the most useful noninvasive imaging modality in differentiation of myocarditis from the other causes of MINOCA, with the implementation of parametric mapping into the original Lake Louise criteria.[2] Postcontrast images could demonstrate the location and extension of myocardial inflammation. In the absence of LGE, elevation of native T1, T2, and extracellular volume could be indicative of ongoing inflammation. On the contrary, stress-induced cardiomyopathy does not typically show LGE. Late gadolinium enhancement may occasionally be seen in a focal and patchy pattern. In this case, the clinical findings and wall motion abnormalities mimic stress-induced cardiomyopathy, but the extensive LGE with typical distribution and presence of edema in the affected segments confirm the diagnosis of myocarditis.

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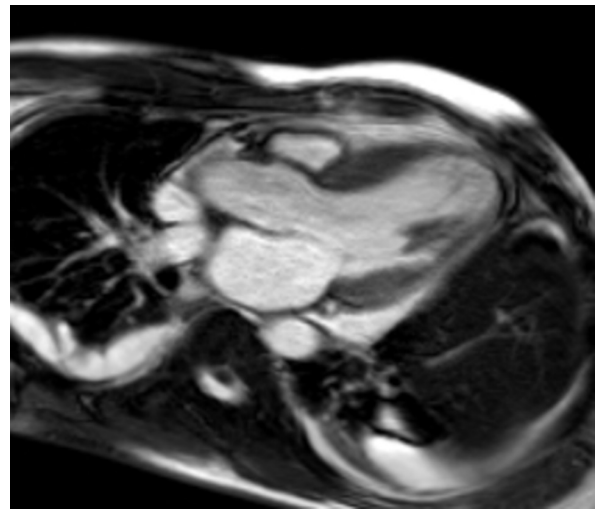

Fig. 2 *Three-chamber steady-state free precession cine image from cardiac magnetic resonance imaging during end-systole shows normal contraction of the basal segments with akinesia of the apical and midventricular segments.*

A supplemental motion image is available for Figure 2.

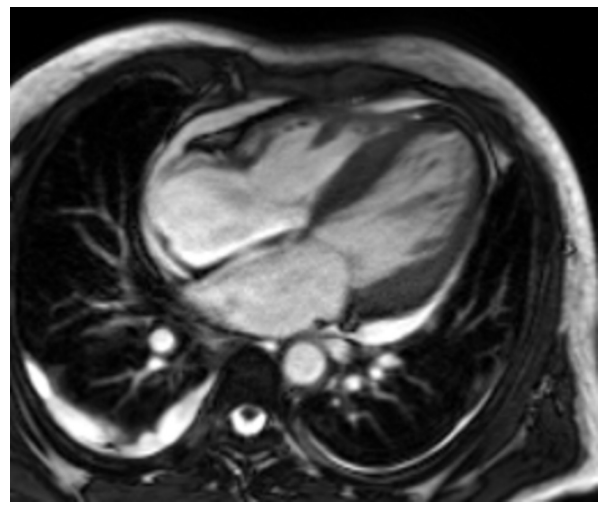

Fig. 3 *Four-chamber steady-state free precession cine image from cardiac magnetic resonance imaging during end-systole shows normal contraction of the basal segments with akinesia of the apical and midventricular segments.*

A supplemental motion image is available for Figure 3.

References

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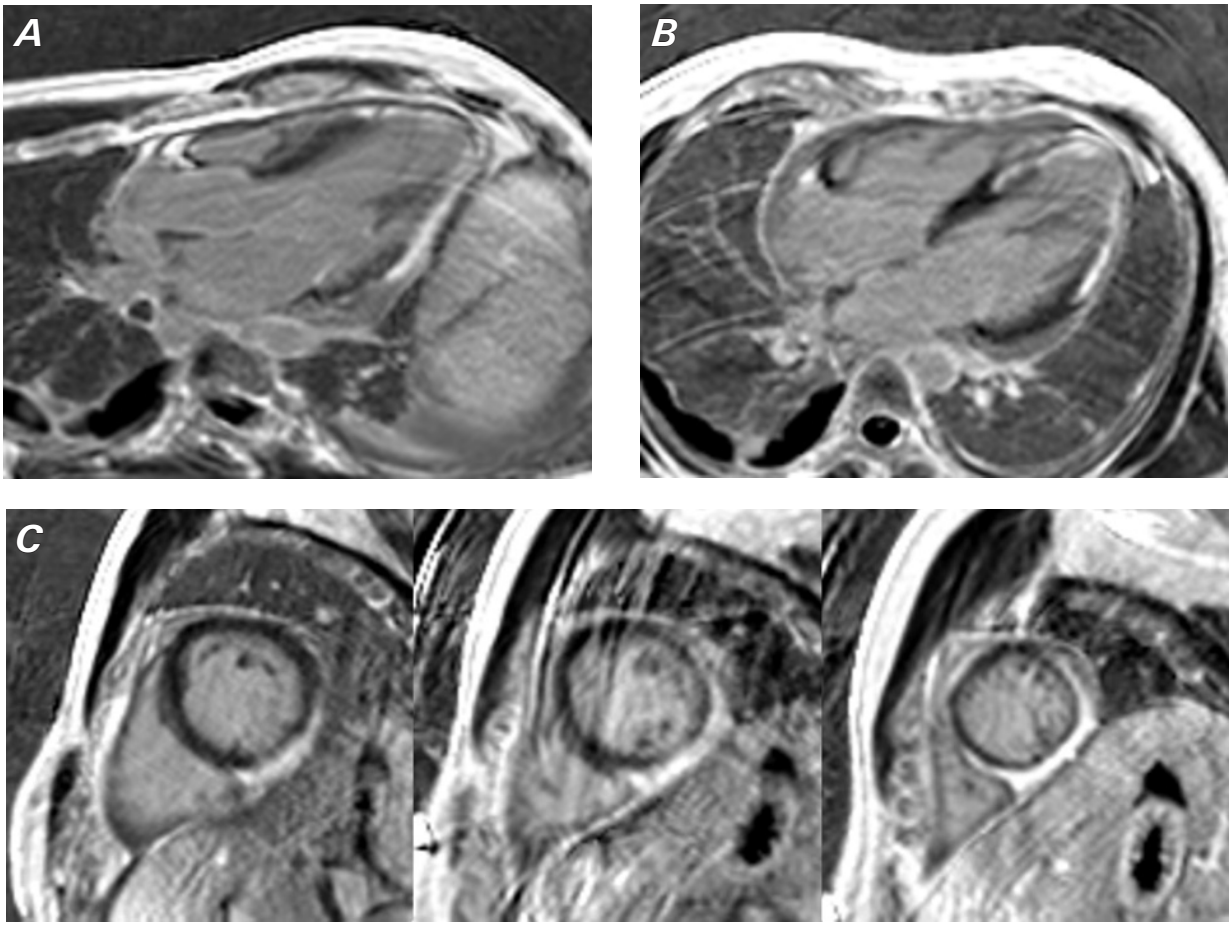

***Fig. 4 A**) Three-chamber, **B**) 4-chamber, and **C**) short-axis LGE images revealed extensive subepicardial to mid-myocardial LGE in the apical and midventricular segments, which is indicative of myocarditis.*

LGE, late gadolinium enhancement.