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Short-Term Outcomes After Myopericarditis Related to COVID-19 Vaccination

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SEVERAL REPORTS HAVE DESCRIBED DEVELOPMENT OF MYOPERICARDITIS AMONG INDIVIDUALS receiving the COVID-19 vaccines,^{1,2} but none have systematically assessed the postdischarge course in these patients. We performed cardiac magnetic resonance (CMR) with tissue characterization, including late gadolinium enhancement, in 11 patients presenting with chest pain and troponin elevation within 14 days after receiving a dose of COVID-19 vaccine, in whom there were no clinical suspicions of acute coronary syndrome (**Table 1**). Median age was 19 years (range 16-53 years), and 10 were men. All patients had a preserved left ventricular systolic function and CMR findings suggestive of myocarditis and/or pericarditis (**Figures 1 and 2**). The length of hospital stay ranged from 1 to 8 days. There were no severe acute complications. At follow-up ranging from 1 to 4 months, 9 patients were asymptomatic. Two reported varying degrees of chest discomfort. CMR findings had generally improved, though not resolved completely (**Figures 1 and 2**).

CONCLUSIONS

The incidence of myocarditis or pericarditis after COVID-19 vaccination has been higher than expected when compared with background rates.^{1,2} Findings on CMR appear to mimic those seen in idiopathic myopericarditis. The course seems benign, but longer-term data are needed to fully clarify the reversibility of the myocardial changes.

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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](#).

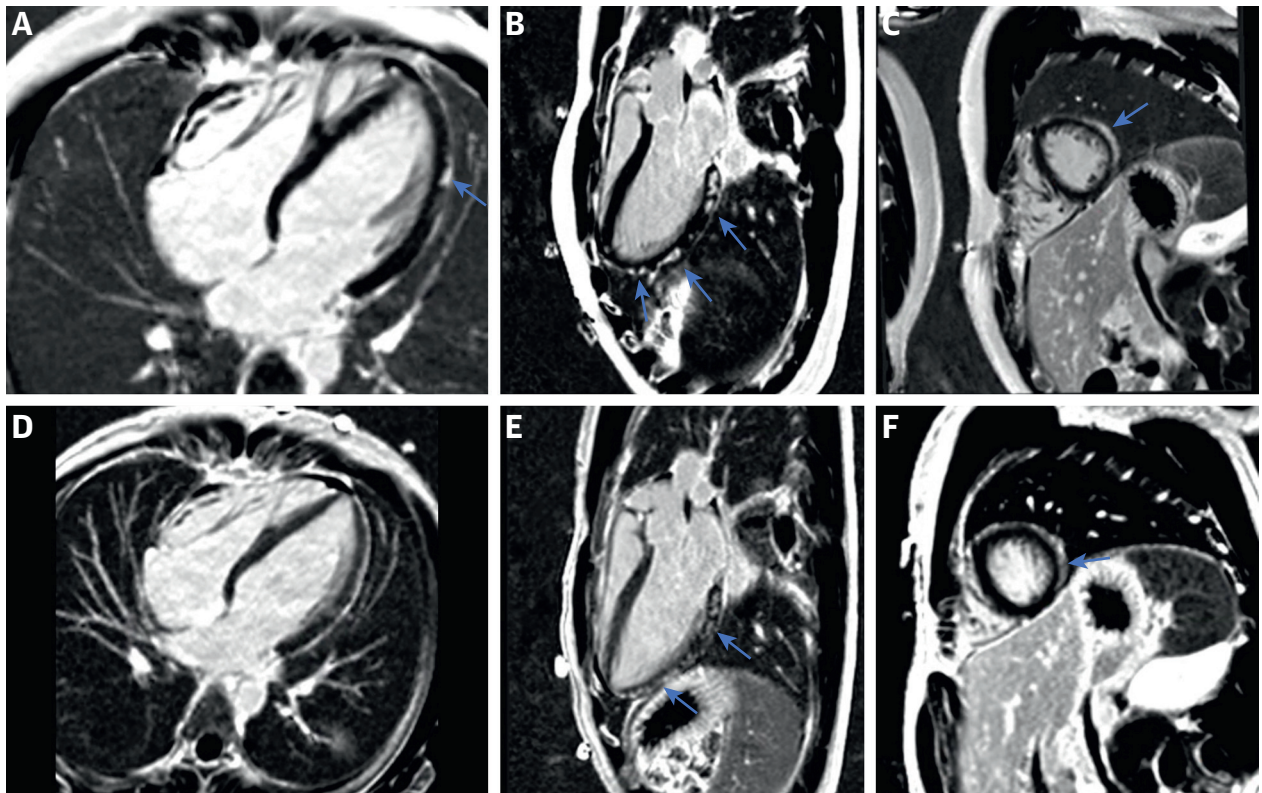
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TABLE 1 Clinical and Imaging Characteristics at Admission and Follow-Up in 11 Patients With Post-COVID-19 Vaccine Associated Myopericarditis

Case	Age, Race, and Sex	Vaccine	Time From Vaccine to Presentation	Symptoms at Admission	CMR Findings at Admission	LVEF and RVEF at Admission ^a	Symptoms at Follow-Up	CMR Findings at Follow-Up	LVEF and RVEF at Follow-Up
1	21-year-old white man	BNT162b2	24 h	Pericarditic substernal chest pain	Edema. Focal epicardial enhancement. Thickening and enhancement of the pericardium.	53% and 44%	4 mo: asymptomatic	Not available	Not available
2	16-year-old black man	BNT162b2	48 h	Fever, fatigue, headache, dyspnea, pericarditic substernal chest pain	Diffuse, patchy edema. Focal subepicardial to near-transmural enhancement. Hyperintense pericardial signal.	57% and 47%	3 mo: intermittent dyspnea and chest discomfort with exertion	2 mo: no edema; continued enhancement, but with improved intensity and thickness; unchanged pericardial signal	54% and 49%
3	17-year-old white man	BNT162b2	72 h	Fever, headache, myalgias, pericarditic substernal chest pain	No edema. Focal epicardial delayed enhancement. Thickening and enhancement of the pericardium.	58% and 50%	4 mo: asymptomatic	2 mo: no edema; continued enhanced, but improved thickness; unchanged pericardial findings	62% and 51%
4	28-year-old black man	mRNA-1273	24 h	Fever, chills, nausea, lethargy, palpitations, chest pain, back pain	Patchy edema. Focal epicardial delayed enhancement. No pericardial abnormalities.	55% and 48%	1 mo: asymptomatic	Not available	Not available
5	18-year-old white man	BNT162b2	24 h	Fever, headache, myalgias, chest pain radiating to left shoulder	Localized edema. Focal, linear delayed epicardial enhancement. Hyperintense pericardial signal and thickened pericardium.	56% and 49%	4 mo: asymptomatic	4 mo: no edema; improved enhancement; mildly thickened pericardium	56% and 50%
6	38-year-old white woman	BNT162b2	24 h	Fever, myalgias, dyspnea, pericarditic substernal chest pain	No edema. Focal delayed mid-myocardial enhancement. No pericardial changes, but trace pericardial effusion.	62% and 62%	2 mo: asymptomatic	3 mo: no edema; near-complete resolution of enhancement; resolution of pericardial effusion	59% and 58%
7	23-year-old black man	BNT162b2	12 d	Epigastric pain, nausea, chest pain	No edema. Linear mid-myocardial delayed enhancement. No pericardial changes.	62% and 53%	2 mo: asymptomatic	Not available	Not available
8	53-year-old white man	Ad26.COV2.S	8 d	Weakness, myalgias, chest pain	No edema. Focal subepicardial enhancement. Diffuse pericardial enhancement and mild thickening. Small pericardial effusion.	70% and 51%	2 mo: asymptomatic	Not available	Not available
9	19-year-old white man	BNT162b2	36 h	Fever, headache, pericarditic substernal chest pain	No edema. Negative enhancement. Bright and prominent pericardium with trivial pericardial effusion.	60% and 53%	2 mo: intermittent palpitations and sharp chest pain	3 mo: focal subepicardial enhancement; unchanged pericardial findings	56% and 49%
10	17-year-old white man	BNT162b2	36 h	Fever, chills, fatigue, myalgias, pericarditic substernal chest pain	No edema. Focal mid-myocardial and epicardial delayed enhancement. No pericardial changes.	61% and 59%	4 mo: asymptomatic	4 mo: no edema; mild improvement in enhancement; hyperintense pericardial signal and thickened pericardium; trivial pericardial effusion	57% and 53%
11	19-year-old white man	BNT162b2	72 h	Palpitations, pericarditic substernal chest pain	No edema. Focal mid-myocardial and near-transmural delayed enhancement. No pericardial changes. Hyperintense pericardial signal and thickened pericardium.	59% and 54%	4 mo: asymptomatic	4 mo: no edema; mild focal improvement in enhancement; hyperintense pericardial signal and thickened pericardium; trivial pericardial effusion	56% and 58%

^aLVEF and RVEF were measured via CMR.

CMR = cardiac magnetic resonance; LVEF = left ventricular ejection fraction; RVEF = right ventricular ejection fraction.

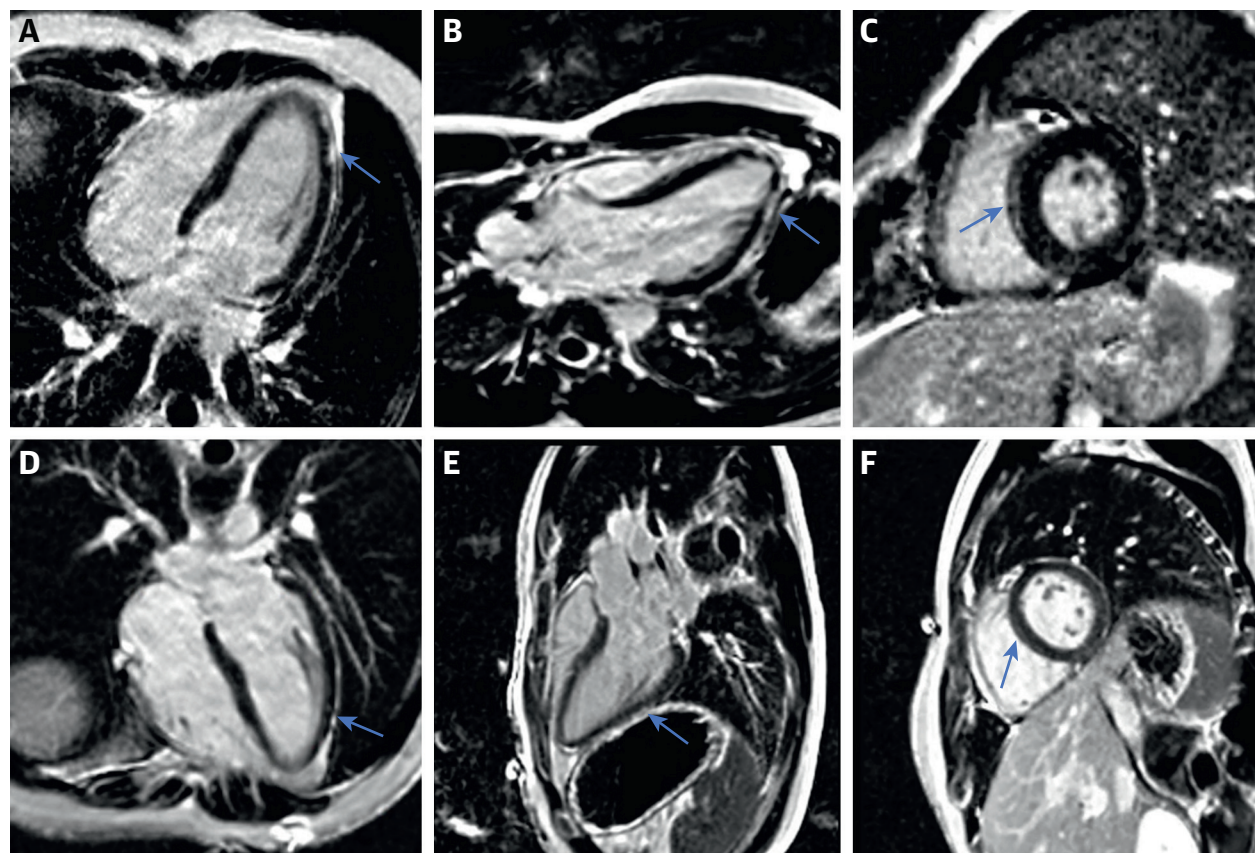
FIGURE 1 Phase-Sensitive Inversion Recovery (PSIR) Images in a 19-Year-Old Man With Post-COVID-19 Vaccine Associated Myopericarditis

(A to C) 4-chamber, 3-chamber, and short-axis images at the time of diagnosis demonstrating remarkable subepicardial and midmyocardial late gadolinium enhancement (LGE) along the left ventricular lateral wall (arrows). (D to F) Follow-up images 3 months after diagnosis. There is mild improvement in the 4-chamber image (D) with minimal to no improvement noted in the 3-chamber and short-axis images (E and F; arrows).

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FIGURE 2 Phase-Sensitive Inversion Recovery (PSIR) Images in an 18-Year-Old Man With Post-COVID-19 Vaccine Associated Myopericarditis

(A to C) 4-chamber, 3-chamber, and short-axis images at the time of diagnosis demonstrating subepicardial late gadolinium enhancement along the left ventricular lateral wall and mid-septal wall (arrows). (D to F) Follow-up images 6 months after diagnosis. There is notable improvement in the quantity and intensity of the late gadolinium enhancement (arrows).

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