

## FOCUS ISSUE ON SPORTS CARDIOLOGY

INTERMEDIATE

## CASE REPORT: CLINICAL CASE

# Coronary Artery Disease, Cardiac Arrest, and Shared Decision Making in a Recreational Athlete



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## ABSTRACT

A highly active 59-year-old-man with a history of cardiac arrest and myocardial infarction presented for exercise recommendations. Multimodality risk stratification led to ventricular fibrillation cardiac arrest at the completion of a maximal effort cardiopulmonary exercise test. Using shared decision making, the safety and feasibility of returning to exercise were discussed. (**Level of Difficulty: Intermediate.**) (J Am Coll Cardiol Case Rep 2022;4:1110-1114)  
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## HISTORY OF PRESENT ILLNESS

A 59-year-old recreational multisport athlete presented to the sports cardiology clinic for discussion of return to exercise following cardiac arrest.

Eighteen months earlier, the patient had a witnessed cardiac arrest at rest. At that time, cardiopulmonary resuscitation (CPR) was started, and the initial rhythm was ventricular fibrillation (VF). The patient was taken to the cardiac catheterization laboratory after having an ST-segment elevation myocardial infarction (MI) pattern on an electrocardiogram (ECG). Angiography confirmed an acute left

anterior descending (LAD) artery occlusion, which was treated with 1 drug-eluting stent.

He followed up with a local cardiologist sporadically, and other than a daily dose of aspirin of 81 mg, he declined taking medications out of concern for drug toxicity. After 18 months without follow-up, he presented to our sports cardiology clinic for counseling regarding safety of exercise. He had been exercising recreationally, although not at his desired intensities. Before his cardiac arrest, he consistently ran half marathons. His current regimen included running 3 miles, 4 times weekly, and occasional resistance training. He denied any cardiopulmonary symptoms, both at rest and with exertion. He was interested in training for a marathon. Thus, he underwent comprehensive sport-specific risk stratification.

The patient's physical examination was unremarkable. The ECG showed normal sinus rhythm at 66 beats/min with multifocal premature ventricular

## LEARNING OBJECTIVES

- To highlight the shared decision-making approach in return to exercise.
- To understand risk stratification in an athlete after cardiac arrest.

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complexes (PVCs) (Figure 1). Given the patient's history of MI, cardiac arrest, and PVCs, cardiac magnetic resonance imaging (CMR), 48-hour Holter monitoring, and a maximal effort cardiopulmonary exercise test (CPET) were ordered.

The Holter monitor demonstrated a 2.6% burden of PVCs, all of which were isolated. CMR demonstrated a nontransmural LAD artery-territory infarct of the anterior left ventricular (LV) wall (Figure 2), with associated hypokinesia (Video 1) and a calculated ejection fraction of 58%.

A treadmill CPET was performed with a customized protocol to maximal effort. The patient's maximum heart rate was 162 beats/min (101% of the predicted maximum). ECG tracings demonstrated 1.5 mm of upslowing ST-segment depressions at peak exertion (Figure 3) that resolved 2 minutes into recovery. There were isolated PVCs throughout exercise (Figure 4). The test was stopped because of the patient's fatigue. The patient had no chest discomfort during exercise.

The respiratory exchange ratio was 1.47, indicating adequate effort. The patient completed 11.5 METs, with a maximal oxygen consumption of

40.2 mL/kg/min. The oxygen pulse was 20 mL/beat. The ventilatory efficacy slope was 24.8 at anaerobic threshold.

Three minutes into recovery, VF developed, and the patient underwent immediate CPR. He received 1 defibrillation with return of spontaneous circulation and regain of consciousness.

### PAST MEDICAL HISTORY

The patient had coronary artery disease with a recent MI. He had been prescribed dual antiplatelet therapy with aspirin and ticagrelor, a high-intensity statin, and a  $\beta$ -blocker. He opted to take only aspirin and ticagrelor, out of concern about side effects with statins and  $\beta$ -blockers. He self-discontinued ticagrelor 1 year after his stent placement.

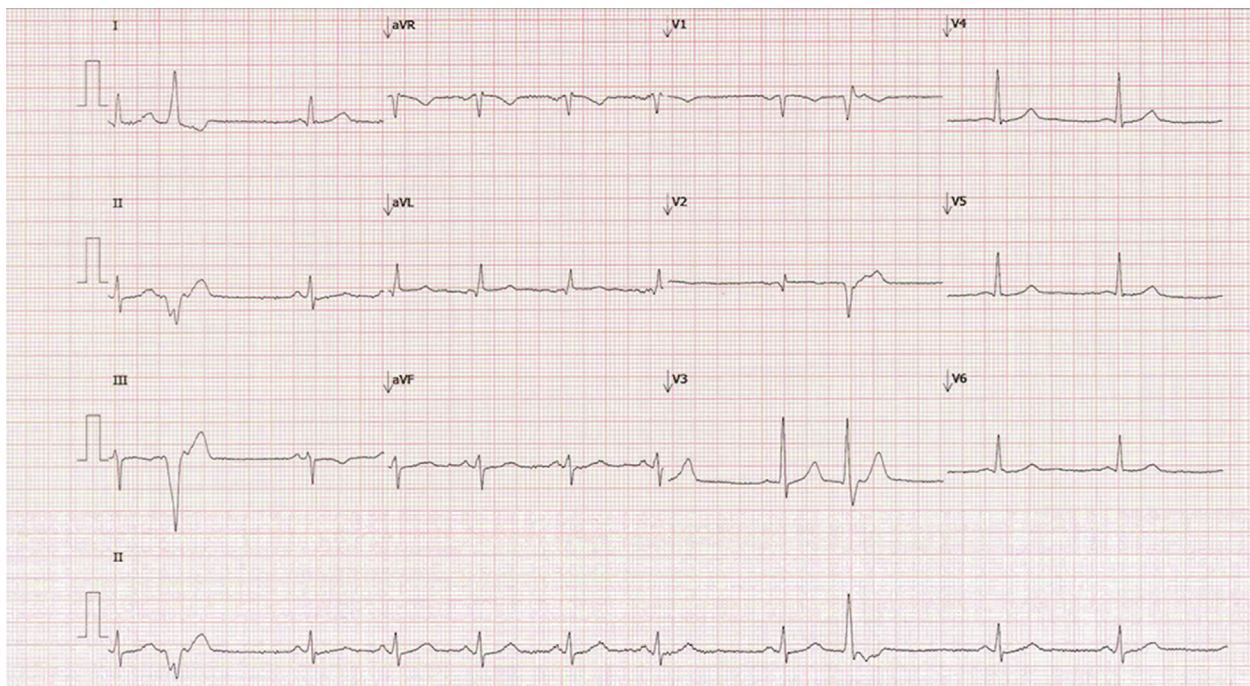
### DIFFERENTIAL DIAGNOSIS

The patient's original VF arrest was in the setting of ischemia secondary to an acute MI. His postexertion

### ABBREVIATIONS AND ACRONYMS

- CMR = cardiac magnetic resonance
- CPET = cardiopulmonary exercise test
- CPR = cardiopulmonary resuscitation
- ECG = electrocardiogram
- ICD = implantable cardioverter-defibrillator
- LAD = left anterior descending
- LV = left ventricular
- MI = myocardial infarction
- PVC = premature ventricular complex
- SDM = shared decision making
- VF = ventricular fibrillation

FIGURE 1 Original Electrocardiogram



Original office electrocardiogram with sinus rhythm at 66 beats/min with multifocal premature ventricular complexes.

**FIGURE 2** Cardiac Magnetic Resonance Gadolinium Enhancement Imaging

Cardiac magnetic resonance demonstrated nontransmural left anterior descending artery-territory infarct of the anterior left ventricular wall, thought to be the nidus of ventricular fibrillation. Arrows denote the infarct.

VF arrest differential diagnoses included ischemia resulting from supply-demand mismatch,<sup>1</sup> plaque rupture in the setting of exertion,<sup>2</sup> and scar-mediated VF.

### INVESTIGATIONS

He was transported to the emergency department for an emergency coronary angiogram. Findings were notable for a patent LAD stent without other significant obstructive coronary artery disease.

### MANAGEMENT

It was recommended that the patient have an implantable cardioverter-defibrillator (ICD) placed while hospitalized, to which he agreed. He was discharged with aspirin (81 mg daily), metoprolol succinate (25 mg daily), and atorvastatin (80 mg daily).

On follow-up, the patient continued taking medications and remained persistent on wanting to exercise. He was offered cardiac rehabilitation but declined. The patient's family was concerned about his ability to exercise safely at high volume and

intensity. A discussion of the risks, benefits, and uncertainties of returning to exercise was held.

The initial discussion focused on the patient's previous resistance to medications. The importance of statins and  $\beta$ -blockers was noted to be imperative to prevent not only progressive coronary disease but also recurrent cardiac arrest.

Next, the discussion focused on the known high-risk status of the patient. Taken as a totality, his myocardial fibrosis, PVC burden, and post-maximal exertion cardiac arrest were noted to be high-risk features. Emphasis was placed on the role that medications and the ICD could play to help modify that risk. High-volume, high-intensity exercise was specifically advised against. With the understanding that he would be followed up closely, it was recommended that the patient gradually increase his walk intensities, and if he were to try to jog, that he do so at no higher intensity than a light, conversational pace.

### DISCUSSION

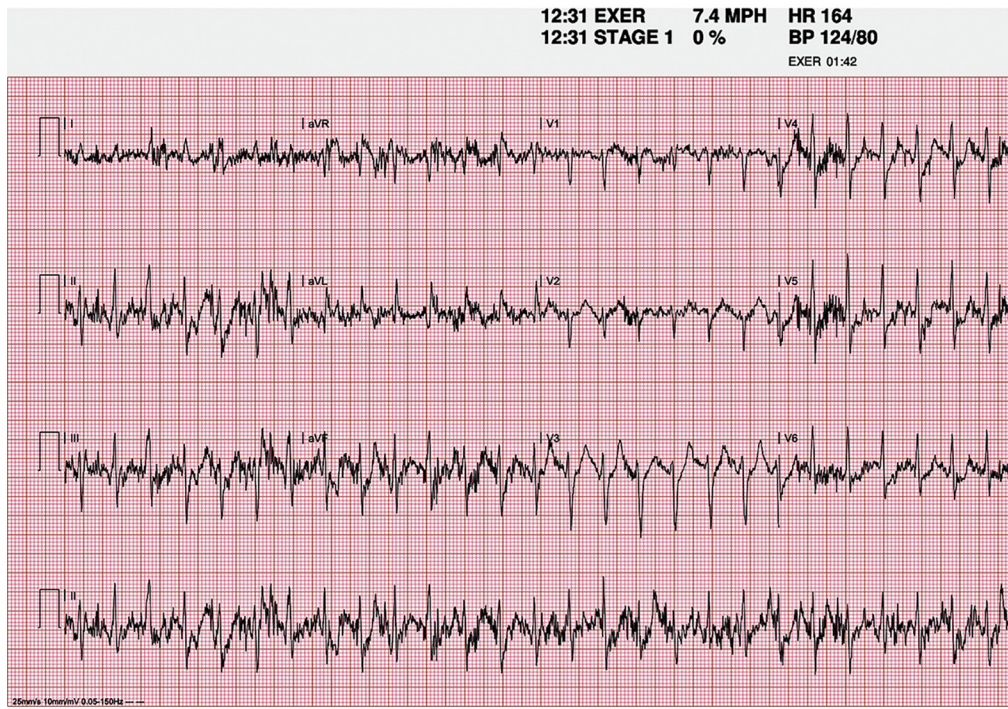
We present a highly active individual with coronary artery disease, myocardial fibrosis resulting from a previous myocardial infarction, recurrent cardiac arrest, PVCs, and poor medical compliance. The patient wanted to return to his previous intensive exercise regimen despite the known risks. This case provides an opportunity to examine shared decision making (SDM) in a high-risk patient.

Risk stratification of an athlete after MI and cardiac arrest can be challenging. The most recent "Eligibility and Disqualification Recommendations for Competitive Athletes With Cardiovascular Abnormalities," from 2015, shed light on returning to exercise for competitive athletes with coronary artery disease and ventricular arrhythmias.<sup>3</sup>

Athletes with known coronary artery disease should undergo risk stratification with functional LV assessment.<sup>3</sup> Our patient underwent a CMR scan with normal LV function, but he had a regional wall motion abnormality and myocardial fibrosis correlating with his previous MI, a known risk factor for ventricular arrhythmias. These recommendations also advocate for maximal effort exercise testing to evaluate exercise tolerance, the presence of inducible ischemia, and the presence of exercise-induced arrhythmias.<sup>4</sup> Our patient's maximal effort CPET elicited VF in the recovery period, thus clearly placing him in a high-risk category.

Having been an athlete for much of his life, our patient maintained his desire to exercise vigorously,

**FIGURE 3** Maximal Exercise Electrocardiogram



Electrocardiogram during a cardiopulmonary exercise test showing 1.5-mm ST-segment depressions at maximal exercise (EXER) that rapidly resolved with rest. BP = blood pressure; HR = heart rate.

and the reasoned that lack of exercise could lead to further cardiac complications. The recommendations suggest the role of SDM in athletic participation.<sup>3</sup> SDM is the process by which clinicians and patients work together to develop care plans on the basis of clinical evidence that balance risks and expected outcomes with patient preferences and values.<sup>5,6</sup> In the case of our patient, specific focus was on his elevated risk of future events. Although his desire to continue to exercise to modify any future cardiovascular morbidity was notable, his goals of running marathons and half marathons were emphasized to be disproportionately optimistic given his findings on testing. It was recommended that exercise may continue, but at reduced intensities because of his high risk.

#### FOLLOW-UP

Our patient is currently 6 months post-cardiac arrest after exercise. He is engaging in fast walking and short jogs without symptoms. He has had no sustained arrhythmias or shocks on ICD interrogation. He has tempered his expectations with regard to volume and intensity of exercise.

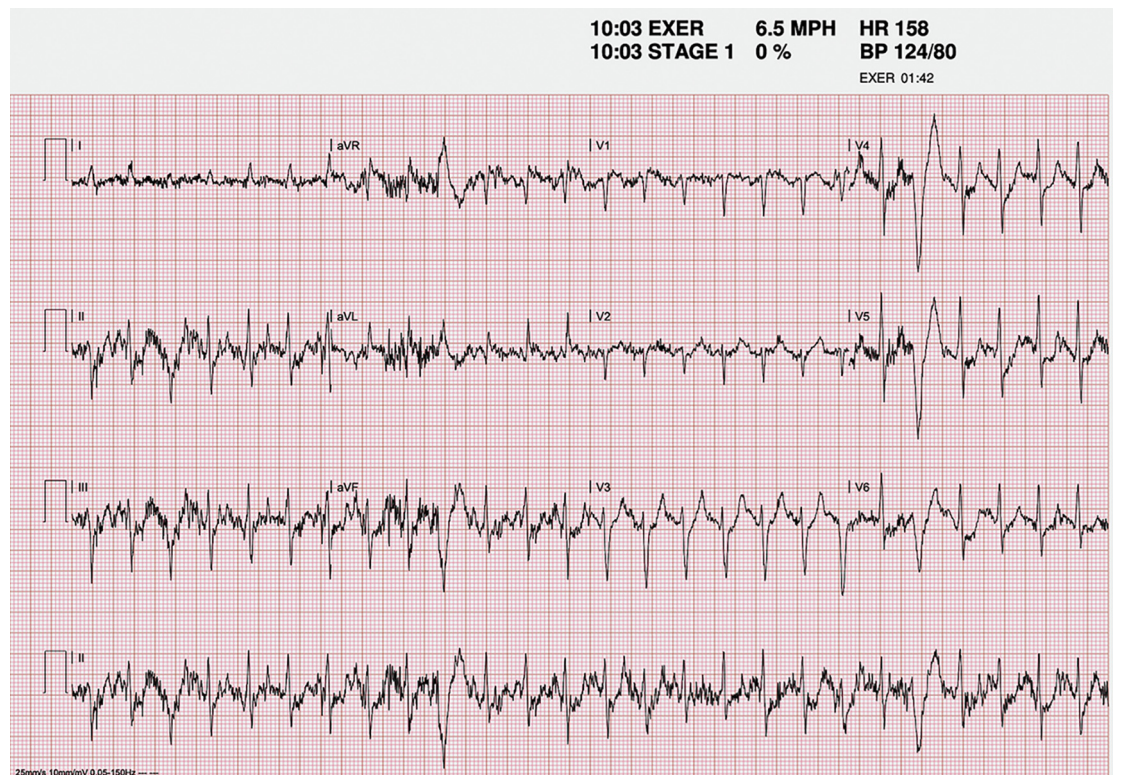
#### CONCLUSIONS

The evaluation of an athlete's return to exercise after an MI and cardiac arrest is unique. It is imperative that risk stratification evaluates for features posing the highest risk, including LV function and inducible arrhythmias. This process must include maximal effort stress testing for proper insight on the cardiovascular system at high intensities. Finally, although patient-centered SDM is important, the discussion must be realistic and balanced, to provide patients with accurate assessments of their risk.

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**FIGURE 4** Electrocardiogram During CPET

Electrocardiogram during a cardiopulmonary exercise test with multiple premature ventricular complexes. BP = blood pressure; EXER = exercise; HR = heart rate.

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**KEY WORDS** athlete, cardiac arrest, exercise, return to exercise, sports cardiology

**APPENDIX** For a supplemental video, please see the online version of this article.