

VASCULAR DISEASE

CASE REPORT: CLINICAL CASE

Spontaneous Coronary Artery Dissection in a 19-Year-Old Male Athlete



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ABSTRACT

We present a 19-year-old male athlete, without cardiovascular risk factors, with anterior ST-segment elevation myocardial infarction caused by left anterior descending artery spontaneous coronary artery dissection. Symptoms began during a swim practice, and patient endorsed using C4 Ripped (Cellucor), a preworkout supplement to enhance athletic performance. We hypothesize that this was the major contributor to presentation. The patient showed improvement after 4 days. (J Am Coll Cardiol Case Rep 2024;29:102189) © 2024 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/>).

HISTORY OF PRESENTATION

A 19-year-old male collegiate swimmer presented to the emergency department (ED) after an episode of substernal, crushing chest pain that started after taking C4 Ripped, a preworkout supplement, and persisted throughout his 2-hour practice. Pain improved with exertion and did not radiate. The patient denied shortness of breath and endorsed nausea. An electrocardiogram (ECG) at the university's health clinic was reportedly concerning for ST-segment elevation myocardial infarction (STEMI). Emergency medical services gave the patient aspirin

and transported him to the hospital. In the ED, patient's blood pressure was 142/106 mm Hg, his heart rate was 78 beats/min, and his respiratory rate was 12 breaths/min on room air. There were no abnormal findings on physical examination, and ECG showed anterior ST-segment elevation consistent with acute STEMI.

PAST MEDICAL HISTORY

The patient was a previously healthy man with attention deficit/hyperactivity disorder and reported taking no medications. The patient denied history of smoking or illicit drug use. He had no cardiac family history aside from hypertension in his paternal grandmother.

LEARNING OBJECTIVES

- To encourage inclusion of SCAD in the differential for chest pain in young male patients, even with no cardiovascular risk factors and good fitness status.
- To recognize that exercise supplements may warrant investigation as potential contributors to SCAD.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis included precocious acute coronary syndrome with STEMI, type II myocardial infarction, takotsubo cardiomyopathy, and coronary vasospasm.

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**ABBREVIATIONS
AND ACRONYMS****ECG** = electrocardiography**ED** = emergency department**LAD** = left anterior descending artery**SCAD** = spontaneous coronary artery dissection**STEMI** = ST-segment elevation myocardial infarction**INVESTIGATIONS**

Electrocardiogram in the ED showed ST-segment elevations in II, III, aVF, and V₃ to V₆ (Figure 1). Echocardiogram showed akinesis of the apical myocardium, hypokinesis of the apical septal and lateral myocardium, mild hypokinesis of the apical anterior and inferior myocardium, and left ventricular ejection fraction of 60% to 65%.

Laboratory test results were remarkable for a white blood cell count of 14.54 10³/μL and a troponin that rose from 0.086 to 1.650 ng/mL and peaked at 27.293 ng/mL (range: 0.00-0.028 ng/mL). A urine drug screen obtained after catheterization was positive only for opiates and benzodiazepines, explained by the medications administered during the procedure. Left heart catheterization showed spontaneous ostial left anterior descending artery (LAD) dissection with superimposed thrombus and distal embolization (Figure 2, Video 1). Intravascular ultrasound was not performed, but angiographic findings in combination with patient characteristics are thought to fit best with type 3 spontaneous coronary artery dissection (SCAD).¹ Computed tomography angiography of the head, chest, abdomen, and pelvis were without evidence of aneurysms elsewhere.

MANAGEMENT

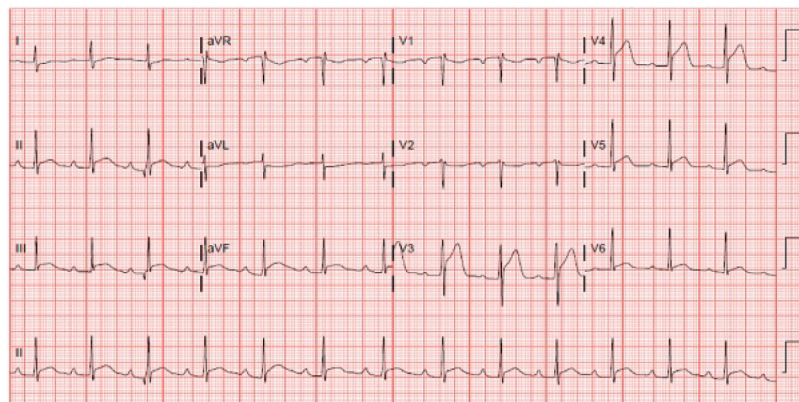
The patient received eptifibatide for 16 hours to treat the LAD thrombus and was started on heparin,

aspirin, clopidogrel, and metoprolol. Repeat heart catheterization on day 4 showed TIMI flow grade 3 as well as a decrease in thrombus burden (Figure 3, Video 2). Patient symptoms improved, and he was discharged on day 6.

DISCUSSION

SCAD is thought to primarily occur because of a hematoma arising de novo in the tunica media of the artery leading to separation of the intima from the media.² The true lumen becomes compressed, causing ischemia and myocardial infarction. This condition is not caused by atherosclerotic disease but can be associated with underlying systemic arteriopathy such as fibromuscular dysplasia or other connective tissue disorders.³ There is limited evidence suggesting a genetic basis for SCAD.² Middle-aged women make up 87% to 95% of SCAD patients.² Typically, they do not have many cardiovascular risk factors compared to patients with myocardial infarction from atherosclerotic disease.³

In the literature, SCAD has been reported very few times in male patients younger than 30 years participating in athletics, to our knowledge—even less when patients without risk factors are considered. One of the earlier reports is from a 28-year-old man, without risk factors, who presented after symptoms started during a baseball game.⁴ A 17-year-old male patient had symptoms begin while playing basketball.⁵ This patient was also previously healthy and did not experience any trauma. However, he did have a

FIGURE 1 Electrocardiogram on Admission

Electrocardiogram was remarkable for ST-segment elevations in II, III, aVF, and V₃ to V₆—consistent with inferior and anterior ischemia.

FIGURE 2 Left Heart Angiogram Image

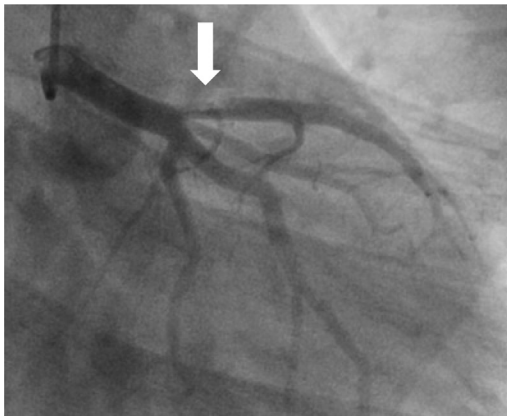


Image of coronary angiogram showing spontaneous ostial left anterior descending artery dissection (white arrow) with superimposed thrombus and distal embolization.

family history of his father experiencing myocardial infarction at age 38 years. Another case reported a 27-year-old man who had onset of symptoms during a competitive cycling race.⁶ This patient was a professional athlete and had no reported risk factors. In that case, angiography was not performed for more than 8 hours because of false reassurance from his young age

FIGURE 3 Repeat Left Heart Angiogram Image

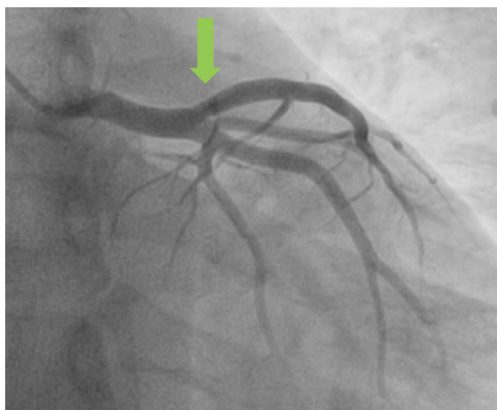


Image of repeat coronary angiogram 4 days after presentation showing improvement of dissection and thrombus burden (green arrow) and TIMI flow grade 3.

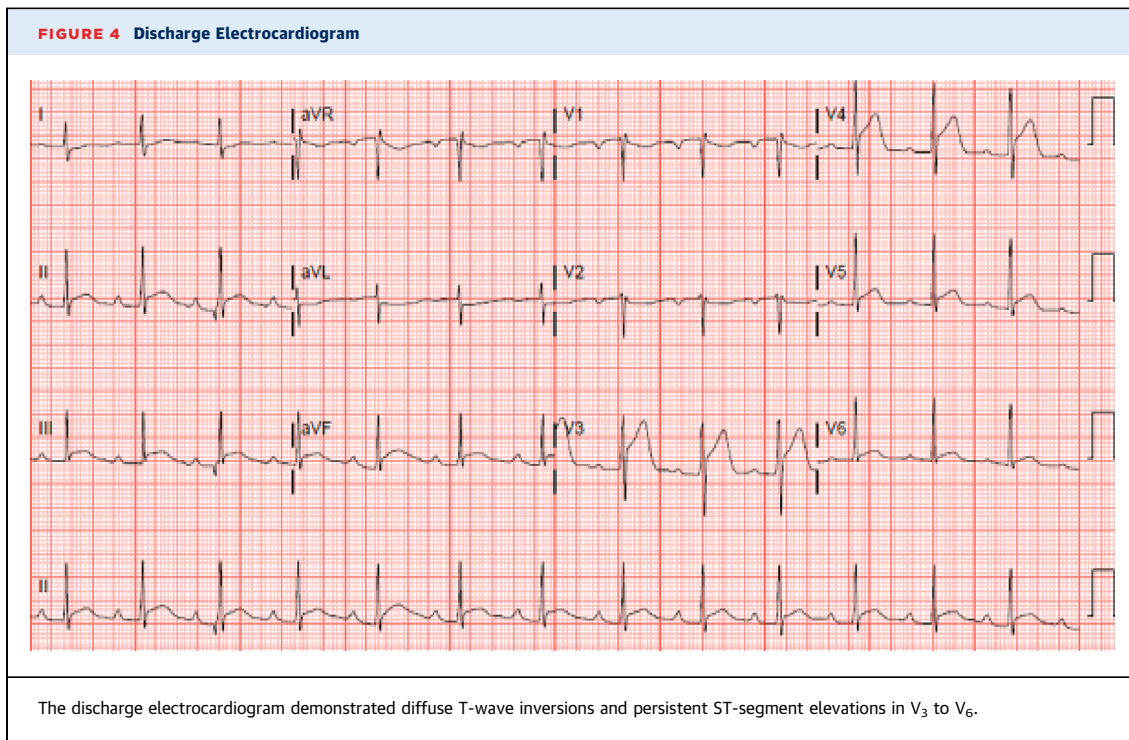
and fitness status. There is also a report of a 26-year-old man experiencing symptoms while playing cricket.⁷ He had no risk factors but reported drinking protein drinks for 3 years to build muscle.

Men with SCAD commonly describe a physical stressor before experiencing symptoms.³ Exercise increases shear stress, which likely initiates dissection. Our patient was a 19-year-old man with no risk factors who took C4 Ripped, a preworkout supplement, before participating in a collegiate swim practice. Preworkout supplements come in various formulations and are designed to enhance athletic performance. They increase circulation and include caffeine, which increases blood pressure. We hypothesize that the C4 Ripped preworkout supplement used by our patient, in combination with vigorous exercise, was a major contributor to the dissection, particularly because the product was reportedly the only new change to the patient's routine.

There is a lack of randomized trials comparing medical therapy with revascularization, and there are higher rates of complications with percutaneous coronary intervention; thus, current management recommendations suggest a conservative approach to SCAD.^{2,8} In addition, 70% to 97% of SCAD patients who are conservatively managed show evidence of healing on angiography after a month, which supports managing this condition conservatively when possible.⁸ Percutaneous coronary intervention may need to be performed in patients with proximal coronary occlusions or hemodynamic instability or in patients who progress even after initial conservative management.² The focus of management should be on restoring TIMI flow grade 3. Medical management includes aspirin and a beta blocker with or without clopidogrel, angiotensin-converting enzyme inhibitor/angiotensin receptor blocker, and a statin.⁸ Patients should be followed closely because rates of recurrence are up to 15% over a median of 27 months.³ As mentioned, this patient was managed conservatively and showed angiographic improvement within 4 days.

FOLLOW-UP

The patient's ECG 2 days after admission had diffuse T-wave inversions and persistence of ST-segment elevations in V₃ to V₆ (Figure 4). Echocardiogram 3 days after admission showed left ventricular ejection fraction of 60% to 65% with hypokinesia of the apical septal and apical myocardium. The patient was



discharged with metoprolol succinate and 1 year of dual-antiplatelet therapy—prasugrel and aspirin—after which he would continue aspirin monotherapy. In outpatient follow-ups, the patient reported “random” palpitations and a low level of consistent pain under the lower left sternum but has denied severe pain since the event. Providers discussed with the patient the high risk of returning to vigorous exercise and recommended cessation of competitive swimming. The patient was also scheduled to follow up with a cardiogenetic specialist. Of note, the patient has endorsed taking part in athletic activities since the event and has not been adherent to medication regimen.

CONCLUSIONS

Even in young patients with a good fitness status, clinical suspicion should remain high for SCAD. To our knowledge, ours is the first case that highlights

the possibility that preworkout supplements may contribute to the occurrence of SCAD in athletes. Additionally, because of the rare nature of SCAD in young athletes, there are no guidelines regarding management and return to play. Our patient’s lack of adherence shows the difficulty young patients have with the drastic change in lifestyle and may require closer follow-up with thorough education regarding the condition. Recommending psychological support may also be necessary in the management of this population.

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The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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KEY WORDS acute coronary syndrome, chest pain, coronary angiogram, myocardial infarction, preworkout, SCAD

 **APPENDIX** For supplemental videos, please see the online version of this paper.