

## IMAGING VIGNETTE

INTERMEDIATE

## CLINICAL VIGNETTE

# Isolated Right Ventricular Myocardial Infarction Presenting With Anterior ST-Segment Elevation



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## ABSTRACT

Isolated right ventricular myocardial infarctions (MIs) are rare, especially those presenting with anterior ST-segment elevation, which is normally seen in anterior MI. This occurs if the right coronary artery is nondominant. Differentiating between them is important for clinical management. Our case demonstrates a right ventricular MI presenting as an anterior ST-segment elevation myocardial infarction. (**Level of Difficulty: Intermediate**) (J Am Coll Cardiol Case Rep 2022;4:556-558) © 2022 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 62-year-old woman with a history of hyperlipidemia and tobacco use presented to the emergency room with chest pain. The electrocardiogram showed anterior ST-segment elevations with no reciprocal depression in the inferior leads (**Figure 1A**). Emergent coronary angiography was performed (**Videos 1 to 7**). The supposed nonculprit vessel was imaged first, revealing a proximally occluded right coronary artery (RCA) (**Figure 1B, Video 1**). The left coronary injection showed no significant stenoses and a dominant left circumflex artery (LCx) supplying the posterior descending artery (PDA) (**Videos 2 to 5**). The thrombotic lesion in the proximal RCA was wired, ballooned, and stented with a 2.25 × 20-mm Synergy drug-eluting stent, which restored flow to the nondominant RCA distally and caused immediate and complete resolution of the patient's symptoms (**Figure 1D, Video 6**). The electrocardiogram changes resolved after RCA recanalization (**Figure 1C**). An echocardiogram after intervention revealed normal left ventricle (LV) function, a hypokinetic right ventricle (RV) with reduced tricuspid annular plane systolic excursion of 1.4 cm, and RV fractional area of change representing a mild RV infarction. The patient quickly recovered and was discharged to receive optimal medical therapy.

Anterior ST-segment elevation myocardial infarction (STEMI) due to occlusion of the left anterior descending artery usually demonstrates ST-segment elevation in leads V<sub>1</sub> to V<sub>4</sub> owing to a positive injury current toward the precordium. Reciprocal ST-segment depression is often present in the inferior leads as a result of superimposition of the negative injury current vector from the anterior wall onto the normal repolarization of the inferior LV myocardium. In this case, the patient presented with ST-segment elevations in

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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](#).

Manuscript received April 9, 2021; revised manuscript received February 22, 2022, accepted March 7, 2022.

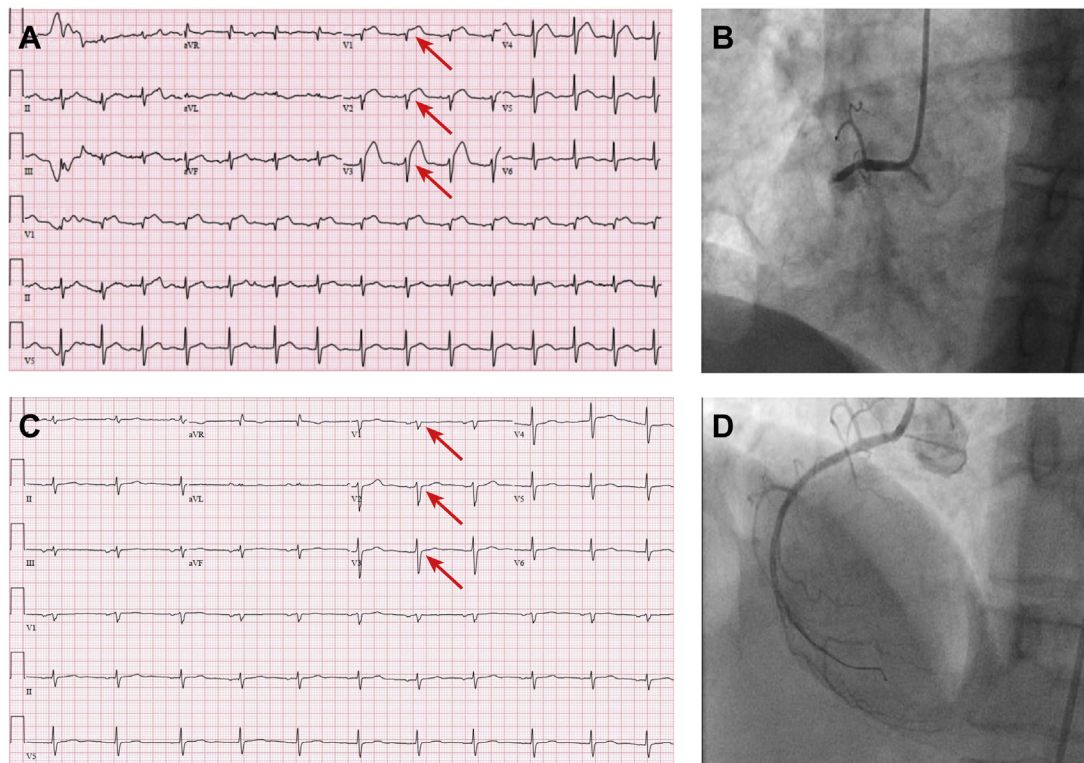
leads V<sub>1</sub> to V<sub>4</sub> without any reciprocal ST-segment depression in the inferior leads, resulting from an acute occlusion of the proximal RCA. In the majority of patients (85%), the RCA is dominant and supplies blood to the PDA. In the 5% to 10% of patients with complete left dominance, the PDA is supplied by the LCx, leading to the nondominant RCA supplying just the RV myocardium.<sup>1</sup> When a nondominant RCA is acutely occluded, the RV becomes ischemic in isolation. Given that it is located anteriorly to the LV, the injury current is greatest in the anterior leads of the precordium. There is no inferior current of injury because the inferior wall is supplied by the LCx. Acute occlusion of a dominant or codominant RCA usually presents as inferior and/or posterior STEMI caused by injury current involving territory supplied by the PDA and/or posterolateral branches. In cases of inferior STEMI involving a dominant RCA, the slightly posteriorly oriented injury vector overwhelms the anteriorly directed RV injury current, and therefore RV infarction is usually demonstrable only on dedicated RV leads (rV<sub>2</sub> to rV<sub>4</sub>).

Whereas anterior LV MI and isolated RV MI may display similar injury patterns, distinguishing between them is important to guide initial management. Reduced RV systolic function as a result of RV infarction may decrease LV preload. Hypotension in a setting of RV infarction may be exacerbated by the administration of nitrates, which reduce preload, but may respond to intravenous volume replacement.<sup>2</sup> By contrast, shock caused by a depressed LV systolic function is treated by inotropic or mechanical support as well as limiting volume resuscitation.<sup>3</sup>

**ABBREVIATIONS  
AND ACRONYMS**

- LCx** = left circumflex artery
- LV** = left ventricle
- MI** = myocardial infarction
- PDA** = posterior descending artery
- RCA** = right coronary artery
- RV** = right ventricle
- STEMI** = ST-segment elevation myocardial infarction

**FIGURE 1** Electrocardiogram and Angiography During an Isolated Right Ventricular Myocardial Infarction



**(A)** Electrocardiogram taken during initial presentation demonstrating normal sinus rhythm with anterior ST-segment elevations in leads V<sub>1</sub> to V<sub>4</sub>. Noticeably absent are inferior ST-segment depression in leads II, III, and aVF: right ventricular infarction. **(B)** Angiographic view demonstrating proximal thrombotic occlusion of nondominant right coronary artery before intervention. **(C)** Electrocardiogram after drug-eluting stent placement demonstrating ectopic atrial rhythm, incomplete right bundle branch block, left axis deviation, and resolution of ST-segment elevations. **(D)** Angiographic view of nondominant right coronary artery showing 0% residual stenosis and TIMI flow grade 3 after wiring, ballooning, and stenting.

## FUNDING SUPPORT AND AUTHOR DISCLOSURES

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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, electrocardiogram, myocardial infarction, right ventricle, stents

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