



Posterior Occlusive Myocardial Infarction on Chronic Right Bundle Branch Block

Andrew Sanchez, M.D.¹ , Omar El-Charif, M.D.² 

¹ Department of Medicine, Harvard Medical School, Beth Israel Deaconess Medical Center,

² Section of Cardiovascular Medicine, Department of Internal Medicine, Yale New Haven Hospital

Journal of Brown Hospital Medicine

Vol. 4, Issue 2, 2025

Article Information

Keywords: Occlusive myocardial infarction, STEMI Equivalents, Electrocardiography, Acute coronary syndrome

<https://doi.org/10.56305/001c.133705>

Submitted: January 28, 2025 EDT

Accepted: March 28, 2025 EDT

Published: April 01, 2025 EDT

Abstract

After experiencing syncope, a woman in her 80s with several cardiovascular risk factors presented to the emergency department with shock. The initial troponin was 3,872 ng/L, and the presenting electrocardiogram (ECG) showed a known right bundle branch block (RBBB), but with ST-segment depressions in V1-V2 out of proportion to the patient's baseline RBBB-related secondary repolarization abnormality. After 3 days of hypotension refractory to antibiotics, left heart catheterization was pursued and demonstrated 100% occlusion of the second obtuse marginal artery, confirming the patient had experienced posterior occlusive myocardial infarction (OMI). This case highlights one ECG pattern consistent with posterior OMI in patients with chronic RBBB.

A woman in her 80s presented to the emergency department after waking up on the floor of her home: she had experienced syncope without warning symptoms, and she recalled lower chest and epigastric discomfort lasting approximately 4 hours the day prior to admission. There was a history of hypertension, hyperlipidemia, chronic kidney disease, and right bundle branch block (RBBB). Physical examination was remarkable for temperature of 100.9°F, heart rate of 98 beats/minute, oxygen saturation of 95% on ambient air, blood pressure of 71/39 mm Hg, no crackles, no jugular venous distension, and no peripheral edema. X-rays displayed displaced tibial and fibular fractures. Initial laboratory results showed a serum bicarbonate of 15 mEq/L (reference range 20-30 mEq/L), anion gap of 18 (reference range 7-17), lactate of 5.1 mmol/L (reference range 0.5-2.2 mmol/L), alanine aminotransferase of 186 U/L (reference range 9-59 U/L), aspartate aminotransferase of 238 U/L (reference range 10-35 U/L), total bilirubin of 1.5 mg/dL (reference range < 1.2 mg/dL), NT-proBNP of 2,128 pg/mL (reference range < 125 pg/mL), and 5th generation troponin of 3,872 ng/L (reference range < 12 ng/L). A transthoracic echocardiogram (TTE) performed in the emergency department revealed an ejection fraction of 51% (from 65% three years prior), but regional wall motion abnormality (RWMA) was not noted.

A 12-lead electrocardiogram (ECG) was recorded ([Figure 1, A](#)), and a baseline ECG was available ([Figure 1, B](#)). The presenting ECG showed 2 to 3 mm ST-segment depression in leads V1 to V2 out of proportion to the baseline ECG's secondary repolarization abnormality related to pre-existing RBBB, as well as subtle ST-seg-

ment elevations in leads II and AVF ([Figure 1](#)). In conjunction with an initial troponin level of nearly 4,000 ng/L, history concerning for cardiogenic syncope, and possible cardiac chest pain, the presenting ECG ([Figure 1, A](#)) was diagnostic of posterior occlusive myocardial infarction (OMI). However, due to fever, metabolic derangements, comorbid fractures, incidental computed tomography findings of pneumomediastinum (likely related to her fall), and lack of initial RWMA, coronary catheterization was delayed, and the patient's developing shock was attributed to sepsis.

Ten hours after the initial ECG, a repeat ECG showed dynamic resolution of ST-segment depressions, but increasing norepinephrine requirements prompted serial troponin measurements that peaked at 4,291 ng/L 12 hours after the first draw. She was immediately thereafter started on aspirin, rosuvastatin, and heparin infusion upon recognition of acute coronary syndrome. Given the norepinephrine requirement did not resolve after 3 days of broad-spectrum antibiotics, repeat TTE was performed and showed RWMA in the anterolateral, basal, and inferior segments. Right and left heart catheterization was urgently reconsidered and pursued. Left heart catheterization showed a left dominant system with 100% occlusion of a large second obtuse marginal (OM2) artery, and otherwise mild to moderate non-obstructive disease in the left anterior descending and right coronary arteries ([Figure 2, A](#)). Right heart catheterization while on 0.08 µg/kg/min norepinephrine revealed pressures (in mm Hg) of 10 in the right atrium, 38/10 in the right ventricle, 40/15 in the pulmonary artery (mean 25), and 15 for pulmonary capillary wedge. The cardiac index was 3.6

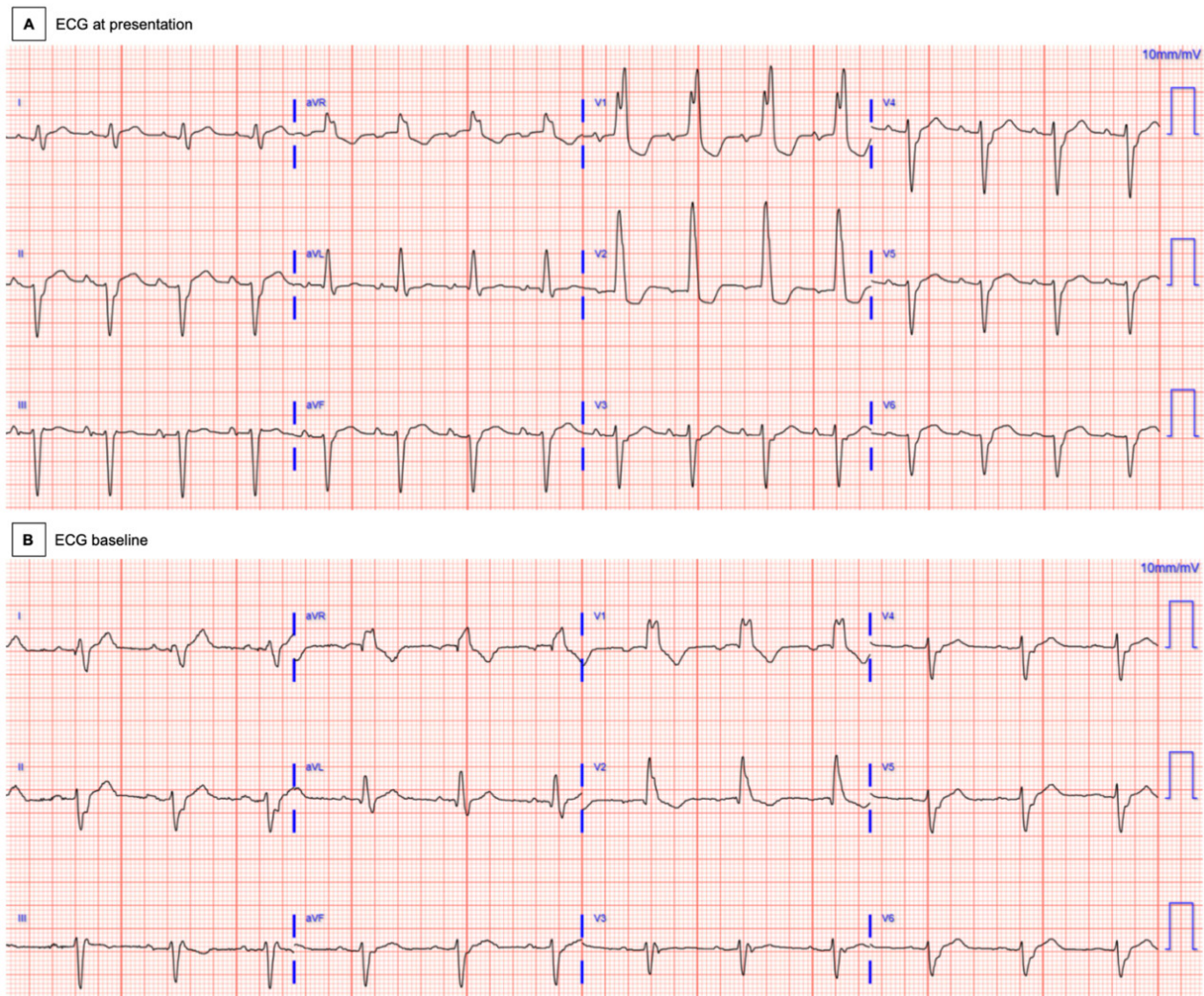


Figure 1. A, An ECG obtained at presentation showed normal sinus rhythm and 2 to 3 mm ST-segment depressions in leads V1 to V2, and subtle ST-segment elevation in leads II and aVF. B, The baseline ECG demonstrates normal sinus rhythm, left anterior fascicular block, and RBBB with secondary repolarization abnormalities (but no ST-segment depressions) in leads V1 to V2.

L/min/m² by Fick's formula. These findings were supportive of mixed cardiogenic and distributive shock. Despite a 72-hour delay, revascularization was pursued via balloon angioplasty (Figure 2, B). The etiology of the patient's distributive shock physiology was ultimately unclear given a negative infectious work-up but may have represented a systemic inflammatory response syndrome related to myocardial ischemia or pneumomediastinum.

ST-segment depression maximal in leads V1-V4 (versus V5-V6) of any amplitude has been shown to be highly specific for posterior OMI, which may or may not be accompanied by inferior ST-segment elevation.¹ The interpretation of ST-segment depression in the context of a pre-existing RBBB poses a particular challenge to the ECG interpreter, as a mild amount of secondary repolarization-related ST-segment depression is expected in RBBB (e.g. < 2 mm).¹ How to navigate this diagnostic challenge is not currently addressed in current acute coronary syndrome guidelines, but published concerning findings include tall anterior precordial R waves (preced-

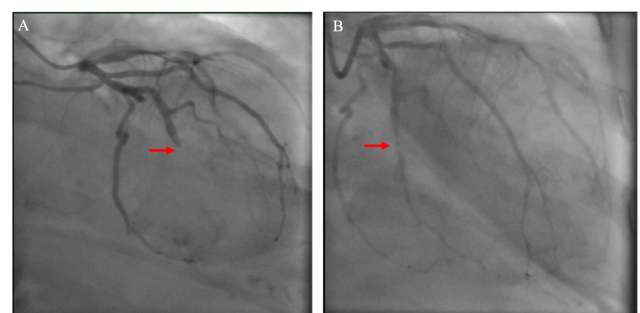


Figure 2. Right anterior oblique caudal images obtained via coronary angiography on day 3 of hospitalization. A, Red arrow points to 100% occluded 2nd obtuse marginal artery prior to intervention. B, Red arrow after balloon angioplasty shows partial reconstitution of perfusion.

ing R' waves) indicating mirrored Q waves, concordant T waves, and marked anterior precordial ST-segment depression (e.g. > 2 mm) out of proportion to that typically seen in RBBB, as in this case.² While the 2022 American College of Cardiology's consensus on the evaluation of

acute chest pain now recognizes anterior precordial ST-segment depression as a “STEMI equivalent” representative of posterior occlusion, this case of missed OM2 occlusion demonstrates how the diagnosis of posterior OMI in patients with pre-existing RBBB can be overlooked, and how OMIs with ECG changes not meeting classic STEMI criteria can be missed when the clinical picture is clouded by comorbid findings.³⁻⁶

Author Contributions

All authors have reviewed the final manuscript prior to submission. All the authors have contributed significantly to the manuscript, per the International Committee of Medical Journal Editors criteria of authorship.

- Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND

- Drafting the work or revising it critically for important intellectual content; AND
- Final approval of the version to be published; AND
- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Disclosures/Conflicts of Interest

The authors declare they have no conflicts of interest

Corresponding Author

Andrew Sanchez
Harvard Medical School
Beth Israel Deaconess Medical Center
Department of Medicine
330 Brookline Ave, Hospital Medicine, West Span 201
Boston, MA, 02215 USA



This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CCBY-NC-4.0). View this license’s legal deed at <https://creativecommons.org/licenses/by-nc/4.0> and legal code at <https://creativecommons.org/licenses/by-nc/4.0/legalcode> for more information.

REFERENCES

1. Meyers HP, Bracey A, Lee D, et al. Ischemic ST-Segment Depression Maximal in V1–V4 (Versus V5–V6) of Any Amplitude Is Specific for Occlusion Myocardial Infarction (Versus Nonocclusive Ischemia). *Journal of the American Heart Association*. 2021;10(23):e022866. doi:[10.1161/JAHA.121.022866](https://doi.org/10.1161/JAHA.121.022866). PMID:34775811
2. Ramjaun A, Garg A, Klaiman M, Sibbald M, Dong JK. ECG Changes in a Case of Posterior Myocardial Infarction in the Presence of Right Bundle Branch Block. *Cureus*. 2021;13(2):e13281. doi:[10.7759/cureus.13281](https://doi.org/10.7759/cureus.13281). PMID:33728214
3. Writing Committee, Kontos MC, de Lemos JA, et al. 2022 ACC Expert Consensus Decision Pathway on the Evaluation and Disposition of Acute Chest Pain in the Emergency Department: A Report of the American College of Cardiology Solution Set Oversight Committee. *J Am Coll Cardiol*. 2022;80(20):1925-1960. doi:[10.1016/j.jacc.2022.08.750](https://doi.org/10.1016/j.jacc.2022.08.750). PMID:36241466
4. de Alencar Neto JN, Scheffer MK, Correia BP, Franchini KG, Felicioni SP, De Marchi MFN. Systematic review and meta-analysis of diagnostic test accuracy of ST-segment elevation for acute coronary occlusion. *Int J Cardiol*. 2024;402:131889. doi:[10.1016/j.ijcard.2024.131889](https://doi.org/10.1016/j.ijcard.2024.131889)
5. McLaren J, de Alencar JN, Aslanger EK, Meyers HP, Smith SW. From ST-Segment Elevation MI to Occlusion MI: The New Paradigm Shift in Acute Myocardial Infarction. *JACC Adv*. 2024;3(11):101314. doi:[10.1016/j.jacadv.2024.101314](https://doi.org/10.1016/j.jacadv.2024.101314). PMID:39435181
6. Ricci F, Martini C, Scordo DM, Rossi D, Gallina S, Fedorowski A, et al. ECG Patterns of Occlusion Myocardial Infarction: A Narrative Review. *Ann Emerg Med*. Published online 2025. doi:[10.1016/j.annemergmed.2024.11.019](https://doi.org/10.1016/j.annemergmed.2024.11.019)