

# 86-Year-Old Man With Sharp Chest Pain and Dyspnea

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An 86-year-old man with a history of coronary artery disease after 3-vessel coronary artery bypass grafting (left anterior descending coronary artery, first and second obtuse marginal branches) in 2000, hypertension, and atrial fibrillation with tachycardia-bradycardia syndrome after permanent pacemaker placement in 2015 presented to his physician with new-onset nonexertional sharp chest pain with radiation to his neck for 1 day. His chest pain was associated with diaphoresis and dyspnea. Before his presentation to the hospital, he had taken 5 baby aspirin tablets and called emergency medical services. He was given nitroglycerin with temporary relief of symptoms en route to the hospital. In the setting of ongoing chest pain in the hospital, he was admitted to the cardiac intensive care unit for further management.

Physical examination revealed a temperature of 36.9°C, heart rate of 64 beats/min, blood pressure of 95/75 mm Hg, and oxygen saturation of 93%. He was in no acute distress. Mildly increased jugular venous distention was observed. Cardiac examination revealed a regular rhythm without murmurs, rubs, or gallops. Lung examination was notable for basilar crackles and mild wheezing. His abdomen was nontender, and his extremities had no edema or signs of a deep venous thrombosis.

Chest radiography revealed cardiomegaly with increased bilateral pulmonary edema, calcified pleural plaques, and pacemaker leads. Electrocardiography (ECG) was notable for a ventricular paced rhythm of 61 beats/min with underlying atrial fibrillation. Laboratory studies revealed the following (reference ranges provided parenthetically): hemoglobin, 13.4 g/dL (13.5-17.5 g/dL); leukocytes,  $6.0 \times 10^9/L$  ( $3.5-10.5 \times 10^9/L$ ); platelet count,  $135 \times 10^9/L$  ( $150-450 \times 10^9/L$ ); sodium, 141 mmol/L (135-145 mmol/L); potassium, 4.7 mmol/L (3.6-5.2 mmol/L); chloride, 104 mmol/L (98-107 mmol/L); creatinine, 1.6

mg/dL (0.8-1.3 mg/dL); international normalized ratio, 3.1 (0.9-1.1); and troponin T, 1.74 ng/mL ( $<0.01$  ng/mL).

## 1. Based on the initial presentation, which one of the following is the most likely etiology of this patient's symptoms?

- Pulmonary embolism (PE)
- Pericarditis
- Pneumonia
- Non-ST elevation myocardial infarction (NSTEMI)
- Unstable angina

The clinical presentation of a PE would consist of tachycardia, tachypnea, pleuritic chest pain, hypoxia, and potentially hemoptysis, which did not fit this patient's presentation. He also lacked any evidence of a deep venous thrombosis on examination, and ECG did not reveal the classic  $S_1Q_3T_3$  pattern, although this is not a highly sensitive ECG finding for a PE and is even less so in the setting of a paced ECG.<sup>1</sup> Cardiac biomarker elevation may also be observed in a PE, but it would typically be lower than this patient's value. Therefore, a search for other etiologies for such a large cardiac troponin elevation should be prompted. Pericarditis would typically present with acute retrosternal pleuritic chest pain. The pain is typically exacerbated when the patient is in a supine position, with inspiration, and with coughing and improves with sitting up or leaning forward. Cardiac biomarker elevation could also be seen in acute pericarditis, but it would only be expected to be mild. Electrocardiography would also classically show widespread ST-segment elevations and PR-segment depressions.<sup>2</sup> Pneumonia would typically present with a cough, fever, an infiltrate on chest radiography, and leukocytosis, none of which are present in this patient. A NSTEMI typically presents with chest pain, diaphoresis, dyspnea, and elevated cardiac biomarkers. This scenario

**See end of article for correct answers to questions.**

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is most consistent with the patient's initial presentation, especially in the context of known coronary artery disease, and should be the first consideration in the differential diagnosis for this patient. An elevation of cardiac troponins distinguishes this patient's NSTEMI from a presentation of unstable angina.<sup>3</sup>

Although the differential diagnosis was broad, the most likely diagnosis for this initial presentation was an NSTEMI, and medical therapy was instituted. Early in the hospital course, the patient's chest pain had recurred and was responsive to intravenous nitroglycerin infusion in the cardiac intensive care unit.

**2. Which one of the following is the most appropriate next test/procedure in the evaluation of this patient in this clinical scenario?**

- a. Cardiac magnetic resonance imaging (MRI)
- b. Transthoracic echocardiography (TTE)
- c. Transesophageal echocardiography
- d. Computed tomographic angiography
- e. Chest radiography

Although cardiac MRI is used to characterize myocardial infarction (MI), its greatest utility is in the post-MI risk stratification assessment rather than in the initial diagnostic work-up. Furthermore, cardiac MRI is not always feasible or available. It would not be the first step in evaluating a patient with an MI. Transthoracic echocardiography is an effective diagnostic tool in the evaluation of patients presenting with an MI because it can accurately identify the location and extent of any wall motion abnormalities that can correlate with current and past infarcts. Hypokinesis seen on TTE may include subendocardial infarcts, while regional akinesis or dyskinesis is more concerning for a transmural infarction.<sup>4</sup> Transesophageal echocardiography is a semi-invasive procedure and is not considered a first-line diagnostic imaging test in the setting of an acute coronary syndrome. Computed tomographic angiography has been found to be effective in detecting stenosis of the coronary arteries, but it is also not indicated when cardiac biomarker elevations are already noted, unless the suspicion for coronary artery disease is very low.<sup>5</sup> Moreover, computed tomographic angiography in patients with known coronary artery disease could be less than ideal

because artifact from existing calcium deposits could make it challenging to accurately assess the coronary arteries. Chest radiography is typically used for evaluation of pulmonary problems including pneumonia and pulmonary edema.

We immediately initiated medical therapy with aspirin (81 mg) and atorvastatin (80 mg), and urgent TTE was obtained to assess left ventricular function, regional wall motion abnormalities, and other cardiac complications. Invasive coronary angiography was deferred initially given the patient's clinical stability and presence of a relative contraindication to invasive coronary angiography (supratherapeutic international normalized ratio, >3), with the contingency plan of reconsidering an invasive assessment as dictated by changes in his clinical course or based on the TTE findings. Transthoracic echocardiography revealed an anterior, loculated, heterogeneous (fluid/thrombus) pericardial fluid collection, left ventricular ejection fraction of 46%, regional wall motion abnormalities in the mid anterior left ventricular segments, and apical anterior, posterior, and septal segments with normal right ventricular function.

**3. Based on the patient's imaging findings, which one of the following is the most concerning complication of the acute MI experienced by this patient?**

- a. Interventricular septal rupture
- b. Post-MI syndrome
- c. Papillary muscle dysfunction
- d. Thrombus embolization
- e. Left ventricular free wall rupture

Interventricular septal rupture would present with hemodynamic compromise, biventricular failure, a new harsh holosystolic murmur, and shunting between the ventricles would be appreciated on TTE.<sup>6</sup> Post-MI syndrome, otherwise known as Dressler syndrome, is an immune-mediated pericarditis against cardiac antigens exposed during myocardial injury and usually presents weeks to months after an MI.<sup>7</sup> Papillary muscle dysfunction would result in acute mitral regurgitation seen on TTE, a new mitral regurgitation murmur, pulmonary edema, hypotension, and cardiogenic shock.<sup>6</sup> Thrombus embolization would present with signs of stroke or ischemia in various parts of the body. The patient's physical examination

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