

# A Woman in Her 80s With Anterior ST-Elevation Myocardial Infarction and Shock



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A woman in her 80s presented with acute onset of chest pain and shock and was transported from the community by emergency medical services for primary percutaneous coronary intervention. The patient had no prior history of heart disease and on arrival was deemed to be Killip class IV, requiring levophed to maintain systolic BP > 80 mm Hg with normal heart sounds; bibasilar crackles were noted while oxygen saturation was maintained at 95% on room air. Her ECG was significant for sinus tachycardia, a right bundle branch block, and anterolateral ST-segment elevation, consistent with a culprit proximal left anterior descending artery lesion.

Angiography confirmed the diagnosis with a culprit 95% calcified proximal left anterior descending artery lesion (Fig 1). Accordingly, primary percutaneous coronary intervention was performed with the implantation of a single bare metal stent (Fig 2). Left ventricular (LV) angiography was not performed because the patient's renal function was not known.



Figure 1 – Suspected 95% culprit lesion in the left anterior descending artery (arrow).

After revascularization, the patient was transferred to the coronary intensive care unit in critical condition for ongoing management.

In the coronary intensive care unit, a focused cardiac ultrasound (FoCUS) with an ultraportable handheld echocardiogram (VScan; GE) was done in addition to standard history, physical examination, and investigations. The admitting intensivist performed our standard FoCUS for assessment of LV function, aortic valve, mitral valve, ascending aorta, and pericardium to determine the next steps in medical management (Videos 1-5).

*Question: Based on the videos and the echocardiogram, what is the most likely cause for the patient's presentation?*

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*Answer:* Pulmonary embolism.

## Discussion

On echocardiogram, the parasternal short axis view of a normal heart will show a circular left ventricle attributing to its predominant pressure.<sup>1</sup> Moreover, in the context of the suspected anterior wall infarction, one could expect akinetic anteroseptal, anterior, and anterolateral segments. In this patient, assessment of the parasternal long and short axis and apical four-chamber view (Videos 1-3, respectively) show normal LV function but a flattened septum with a D-shaped left ventricle during systole (Fig 3). Coupled with the enlarged right ventricle (RV), these findings are consistent with RV pressure overload.<sup>1</sup> Videos 4 and 5, subcostal views, revealed a large mobile mass in the right atrium arising from the inferior vena cava (Fig 4). Given these findings, the diagnosis of thrombus in transit and pulmonary embolism (PE) was identified as the cause of the patient's presentation.

Urgent CT scan of the chest demonstrated diffuse bilateral pulmonary emboli with no evidence of thrombus in the right atrium (Figs 5, 6). A FoCUS scan was immediately repeated on return to the cardiac intensive care unit (Video 6, subcostal view) and demonstrated that the previously documented thrombus in the right atrium was no longer present (Fig 7).

Diagnosis of a myocardial infarction is based on history, physical examination, ECG, coronary angiography, and cardiac biomarkers.<sup>2</sup> The current patient's presentation of chest pain, ST-segment elevation, and new right



Figure 2 – Postpercutaneous coronary intervention demonstrates widely patent stent (arrow).

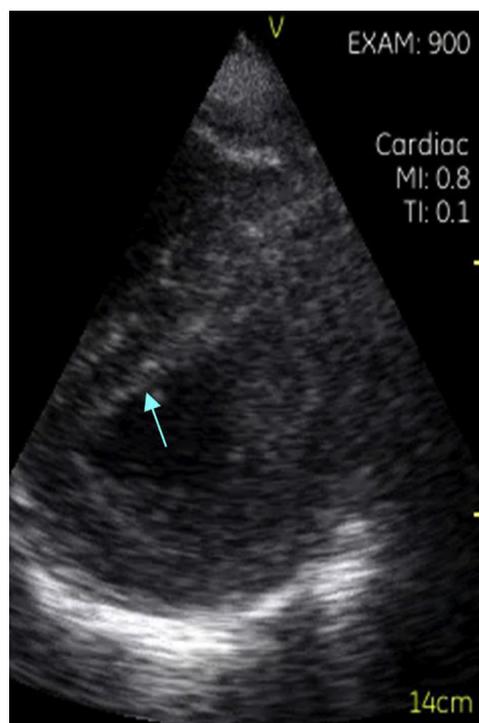


Figure 3 – Focused cardiac ultrasound parasternal short axis view demonstrates D-shaped septum consistent with right ventricular pressure overload (arrow).

bundle branch block is typical of both large anterior wall infarctions and can be mimicked by large PEs. Moreover, the coincidental appearance of a high-grade lesion in the correct anatomic distribution was consistent with coronary ischemia as a plausible etiology for the patient's presentation.<sup>2</sup>

PEs can present with dyspnea, chest pain, syncope, and hypotension. Diagnosis can be based on the probability of thromboembolism by using a probability model, such as the Wells score, in conjunction with diagnostic imaging.<sup>3</sup> In some cases, such as the one presented here, there is clinical overlap between the diagnostic feature of myocardial infarction and PE. Biomarkers TnI and TnT are found elevated in 7% and 32% of patients, respectively, and play a role in determining the probability of adverse outcomes and prognosis of PE.<sup>4</sup> Common ECG changes include tachycardia and the McGinn-White sign, S1Q3T3.<sup>5</sup> On rare occasion, there is ST-segment elevation in the anterior leads, which can mimic those of a ST-segment elevation myocardial infarction.<sup>5,6</sup>

This case highlights the benefits of routine FoCUS assessment in patients with what appears to be an otherwise straightforward diagnosis (Video 7). In

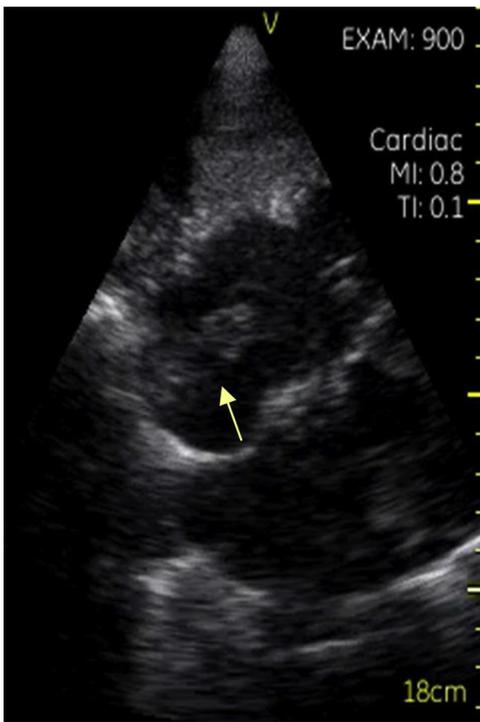


Figure 4 – Subcostal view demonstrates thrombus in transit in the right atrium (arrow).

conjunction with history and physical examination, routine FoCUS allows physicians to assess LV and RV function and the pericardium with significantly greater accuracy than physical examination alone. Although not routinely performed in our institution, point-of-care lung ultrasound and assessment of the deep venous system can complement FoCUS in assessment of patients with suspected PE.<sup>7</sup> Prompt identification of alternative or unexpected diagnosis can result in dramatic differences in both treatment and prognosis.

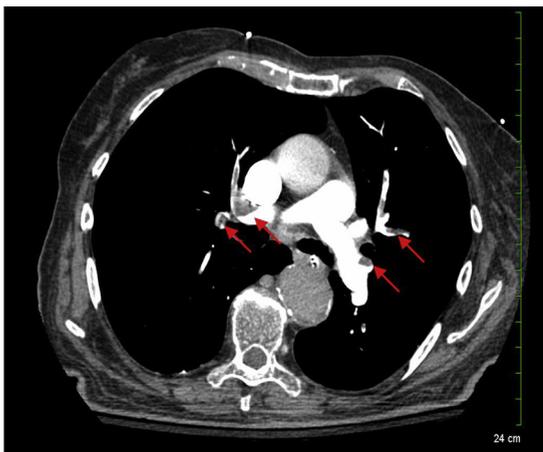


Figure 5 – CT scan shows multiple pulmonary emboli (arrows).



Figure 6 – No thrombus is identified in the right atrium (asterisk indicates the right atrium).

Similarly, documented cases of alternative diagnoses have been reported with routine application of FoCUS on admission.<sup>8,9</sup> In this patient, FoCUS was vital for directing diagnostic imaging and treatment.

This case highlights the value of routine FoCUS scanning as a useful adjunct to history and physical examination to aid in accurate diagnostic assessment of cardiac patients who are critically ill.

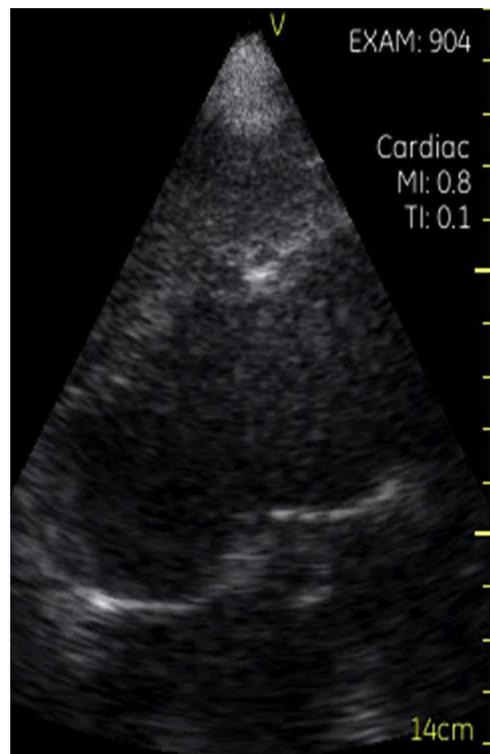


Figure 7 – Repeat subcostal view demonstrates absence of thrombus consistent with embolism to the pulmonary arteries.

## Reverberations

1. *The differential diagnosis for chest pain and shock includes PE, aortic syndromes, and myocardial infarction.*
2. *PE can mimic acute coronary ischemia, leading to misdiagnosis and inappropriate treatment.*
3. *A FoCUS scan allows point-of-care evaluation of LV function, RV function, pericardium, and aorta.*
4. *A FoCUS scan as an adjunct to careful history and physical examination can increase diagnostic accuracy in assessment of patients with chest pain and shock.*

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**Additional information:** To analyze this case with the videos, see the online article.

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