

AMSER Case of the Month

October 2024

70-year-old male with a history of CAD presents to the emergency department in cardiac arrest

Miles Lewis, MS4, University of Michigan Medical School

Elizabeth Lee, MD, Michigan Medicine, Division of Cardiothoracic Radiology



**MICHIGAN
MEDICINE**



Patient Presentation

- **HPI:** 70-year-old male with a history of CAD arrives to the ED via EMS in cardiac arrest after endorsing chest pain at home prior to collapsing. He received CPR with return of spontaneous circulation while in the ED.
- **PMH:** CAD
- **PSH:** non-contributory
- **Meds:** none
- **SH:** >60 pack year smoking history
- **FH:** non-contributory

Pertinent Labs/Testing

- Troponin T 105
- ABG pH 7.18, pCO₂ 45, HCO₃ 17, Lactate 7.5
- Initial 12-lead ECG was negative for evidence of myocardial ischemia

What Imaging Should We Order?

Select the applicable ACR Appropriateness Criteria

American College of Radiology
ACR Appropriateness Criteria®
Suspected Acute Aortic Syndrome

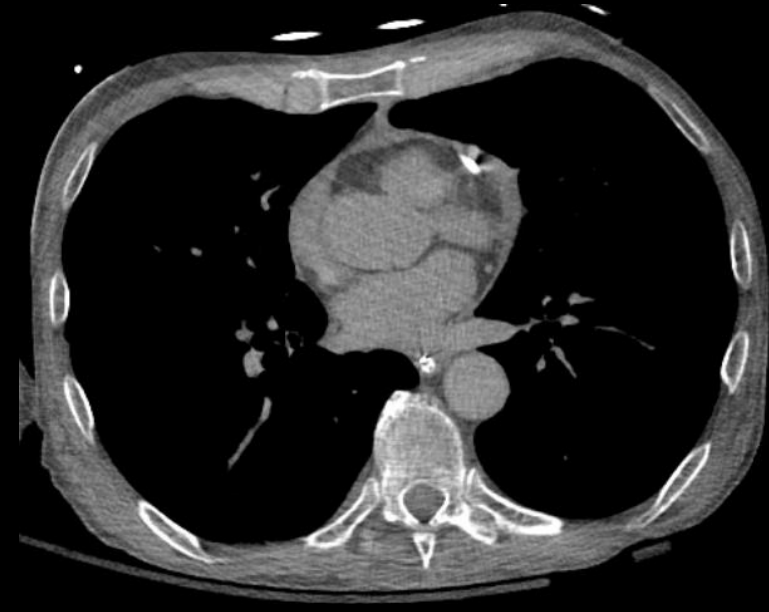
Variant 1: Acute chest pain; suspected acute aortic syndrome.

Procedure	Appropriateness Category	Relative Radiation Level
US echocardiography transesophageal	Usually Appropriate	○
Radiography chest	Usually Appropriate	⊗
MRA chest abdomen pelvis without and with IV contrast	Usually Appropriate	○
MRA chest without and with IV contrast	Usually Appropriate	○
CT chest with IV contrast	Usually Appropriate	⊗⊗⊗
CT chest without and with IV contrast	Usually Appropriate	⊗⊗⊗
CTA chest with IV contrast	Usually Appropriate	⊗⊗⊗
CTA chest abdomen pelvis with IV contrast	Usually Appropriate	⊗⊗⊗⊗⊗
US echocardiography transthoracic resting	May Be Appropriate	○
Aortography chest	May Be Appropriate	⊗⊗⊗
MRA chest abdomen pelvis without IV contrast	May Be Appropriate	○
MRA chest without IV contrast	May Be Appropriate	○
MRI chest abdomen pelvis without IV contrast	May Be Appropriate	○
CT chest without IV contrast	May Be Appropriate	⊗⊗⊗
CTA coronary arteries with IV contrast	May Be Appropriate	⊗⊗⊗
MRI chest abdomen pelvis without and with IV contrast	Usually Not Appropriate	○



This imaging modality was ordered by the ER physician

Axial CT Chest w/o Contrast (unlabeled)



Sagittal CT Chest w/ Contrast (unlabeled)



Axial CT Chest w/ Contrast (unlabeled)

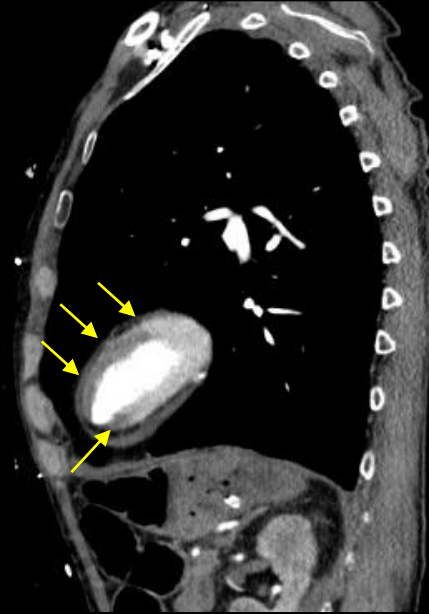
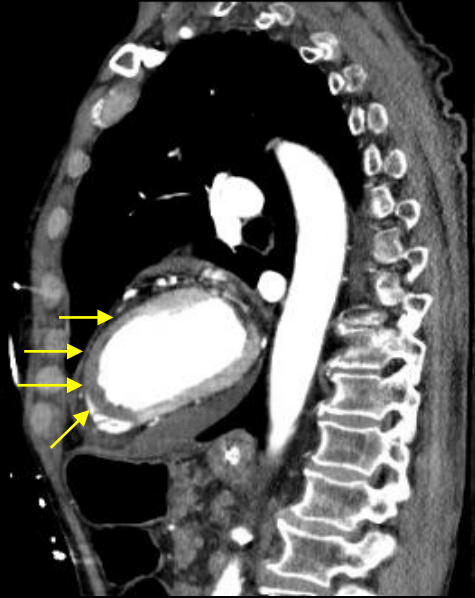
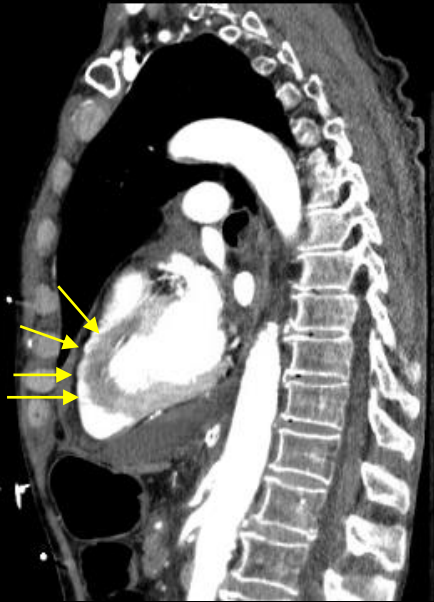


Axial CT Chest w/o Contrast (labeled)

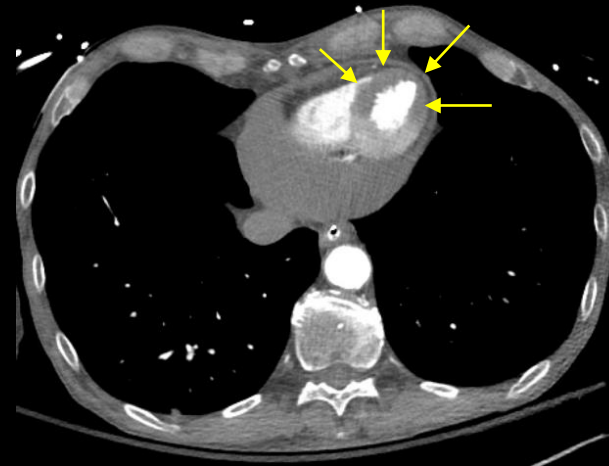
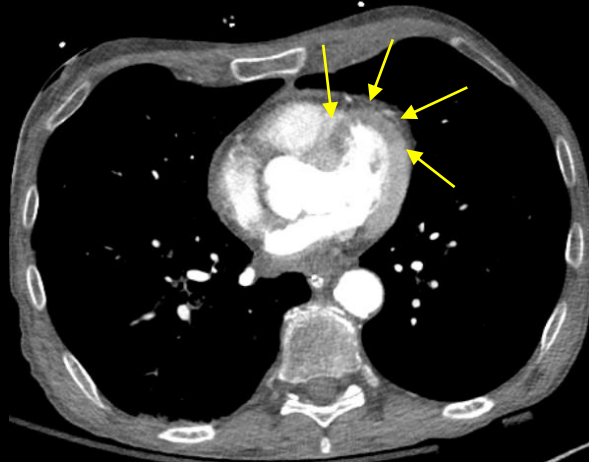
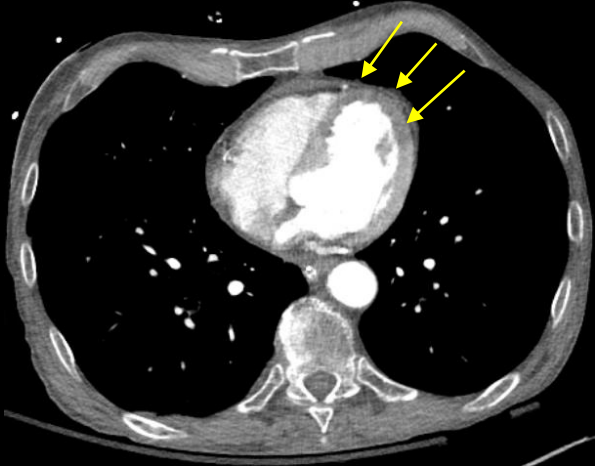


The without contrast images show severe calcification of the left anterior descending coronary artery (arrows).

Sagittal and Axial CT Chest w/ Contrast (labeled)



The sagittal and axial contrast-enhanced images shows decreased myocardial enhancement of the left ventricular apex and anterior wall (arrows).



Final Dx:

Acute Left Anterior Descending Myocardial Infarction

Case Discussion – Overview¹

- **Definition:**
 - Ischemic necrosis of the myocardium due to insufficient supply of oxygen
- **Etiology:**
 - Most commonly atherosclerotic plaque rupture leading to coronary artery thrombosis
 - Less commonly coronary artery embolisms, coronary artery vasospasm, coronary artery dissections
- **Symptoms:**
 - Retrosternal chest pain, dyspnea, mandibular pain, upper extremity pain, diaphoresis, epigastric discomfort, syncope
- **Treatment:**
 - Reperfusion treatment is indicated in all patients with symptoms of ischemia of <12 hours
 - Primary acute treatment includes percutaneous coronary intervention (preferred) or fibrinolysis if PCI is not available in a timely manner (>120 minutes)
 - Long term treatment includes optimization of comorbidities (i.e., HTN, DM, HLD) and mitigation of other risk factors (i.e., smoking)
- **Complications:**
 - Cardiogenic shock, cardiac failure, left ventricular aneurysms, cardiac free wall rupture, arrhythmia, pericardial effusion, pericarditis

Case Discussion – Diagnostics/Imaging Features

- Acute myocardial infarctions are classically diagnosed in patients with elevated troponins and characteristic ECG findings; however, they may be discovered on imaging in patients with vague symptoms who are undergoing workup to rule out other etiologies of chest pain (i.e., PE, aortic dissection).
- **Echocardiography²**
 - Diastolic dysfunction that typically precedes systolic dysfunction
 - Segmental wall motion abnormalities
- **Contrast-enhanced CT^{3,4}**
 - Decreased myocardial enhancement in a specific coronary artery distribution
 - Abrupt areas of contrast opacification interruption in the coronary arteries
- **MRI⁵**
 - Increased T2-weighted signal intensity from myocardial edema in a vascular territory

References:

1. Mechanic OJ, Gavin M, Grossman SA. Acute Myocardial Infarction. In: *StatPearls*. Treasure Island (FL): StatPearls Publishing; September 3, 2023.
2. Greaves SC. Role of echocardiography in acute coronary syndromes. *Heart*. 2002;88(4):419-425. doi:10.1136/heart.88.4.419.
3. Gosalia A, Haramati LB, Sheth MP, Spindola-Franco H. CT detection of acute myocardial infarction. *AJR Am J Roentgenol*. 2004;182(6):1563-1566. doi:10.2214/ajr.182.6.1821563.
4. Luciano A, Luigi S, Mancuso L, et al. Incidental findings of acute myocardial infarction detected during ECG-gated and nongated thoracic CTA: A report of four cases. *Radiol Case Rep*. 2023;18(8):2567-2573. Published 2023 May 23. doi:10.1016/j.radcr.2023.04.026.
5. Perazzolo Marra M, Lima JA, Iliceto S. MRI in acute myocardial infarction. *Eur Heart J*. 2011;32(3):284-293. doi:10.1093/eurheartj/ehq409.