Post-infarction full-thickness myocardial rupture: a life-saving CT diagnosis
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Section: Cardiovascular
Area of Interest: Cardiac
Procedure: Contrast agent-intravenous
Imaging Technique: CT
Special Focus: Haemorrhage
Case Type: Clinical Cases
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Patient: 67 years, male

Clinical History:
An overweight male was admitted to the emergency department with oppressive retrosternal pain and paresthesias along his left arm, lasting approximately 15 minutes. Medical history included several cardiovascular risk factors, obliterating atheromatous disease of the lower limbs. Serum troponin I and electrocardiographic findings were consistent with ST-elevation acute myocardial infarction.

Imaging Findings:
Early coronary angiography identified a critical stenosis of the right coronary artery (RCA), which was treated by stenting. 24 hours later the patient experienced haemodynamic shock, intra-aortic balloon pump was positioned, repeated coronary angiography positioned a second RCA stent just proximally to the previous one. During further deterioration with severe shock and metabolic acidosis, echocardiography detected appearance of pericardial effusion. Emergency multidetector CT (Fig.1) showed hemopericardium, contrast medium flowing through a full-thickness discontinuity of the left ventricle (LV) lateral wall consistent with complete myocardial rupture.

Immediate cardiac surgery under extracorporeal circulation was performed. After pericardiotomy, partially clotted blood was removed from the pericardial cavity and active bleeding from the LV free wall was detected in the territory of the obtuse marginal branch. Surrounded by friable necrotic myocardium, the laceration was repaired by mattress suture. The patient eventually recovered after intensive care including dialysis to treat acute kidney injury.

Discussion:
Life-threatening complications of acute myocardial infarction (AMI) include cardiogenic shock, arrhythmias, and left ventricular myocardial rupture (LVMR). Before the introduction of primary reperfusion therapy, LVMR occurred in approximately 3-4% of patients and accounted for 30% of AMI-related deaths. Currently, widespread early treatment of acute coronary syndromes with percutaneous coronary intervention or thrombolysis resulted in decreased incidence (1.3%) of LVMR [1]. Autopsy studies revealed that spontaneous (non-traumatic) myocardial rupture develops through a recent transmural AMI, most usually at the anterior (over 50% of cases) or lateral left ventricle (LV) wall. Most patients present in the eight decade of life, with severe coronary atherosclerosis (occlusive in 33% of cases), frequently during their first AMI. Early (within 24 hours from symptom onset) LVMR accounts for half of cases, manifests with sudden shock, and generally causes death from the combined effects of cardiac tamponade and bradyarrhythmia or
electromechanical dissociation. Alternatively, late myocardial rupture may follow a subacute course with increasing pericardial effusion and more or less severe haemodynamic compromise [1, 2]. Cardiologists generally diagnose LVMR by transthoracic or transesophageal echocardiography, or during invasive left ventriculography. Albeit scarcely reported in the imaging literature, CT may effectively detect complete myocardial rupture as a full-thickness defect of the free LV wall, from which contrast medium extravasates from the LV cavity into the pericardial space [3-5]. Since CT is increasingly performed to investigate or rule out possible causes of acute chest pain, radiologists should be aware of this appearance and thoroughly search for myocardial discontinuity CT studies performed in patients with suspected or confirmed AMI, particularly when hemopericardium is present [3-6]. Alternatively, LVMR may be contained by adherent pericardium, leading to formation of a (subepicardial) pseudoaneurysm, which appears at CT or MRI as localized (blister-like) contrast outpouching with narrow neck. More common at the inferolateral LV wall, pseudoaneurysms have a very high (30-45%) risk of rupture [7-9]. A possible differential diagnosis is represented by high-attenuation pericardial effusion from vicarious excretion of contrast medium following cardiac catheterisation [10]. As this case exemplifies, prompt recognition of LVMR and timely intervention can be life-saving. Treatment involves drainage of hemopericardium, surgical identification and repair of the myocardial perforation [1, 2].

**Differential Diagnosis List:** Hemopericardium from spontaneous full-thickness myocardial rupture during acute myocardial infarction., High-attenuation pericardial fluid after cardiac catheterisation, Pericarditis, Contained myocardial rupture, Left ventricular subepicardial (false) aneurysm, Acute pulmonary embolism, Aortic dissection / intramural haematoma

**Final Diagnosis:** Hemopericardium from spontaneous full-thickness myocardial rupture during acute myocardial infarction.

**References:**


Figure 1

Description: Coronal reconstructed image from preliminary unenhanced acquisition revealed hyperattenuating (55 Hounsfield units) pericardial effusion (+) consistent with hemopericardium. Origin: Tonolini M, Department of Radiology, “Luigi Sacco” University Hospital – Milan (Italy)
**Description:** Arterial-phase enhanced acquisition with bolus tracking technique showed contrast medium (*) extravasation through a full-thickness breach (Arrow) of the lateral wall of the left ventricle. Note hemopericardium(+), intra-aortic balloon pump(arrowhead). **Origin:** Tonolini M, Department of Radiology, “Luigi Sacco” University Hospital – Milan (Italy)
Description: Coronal (C), sagittal (D), oblique (E) and 3D volume-rendering reconstruction (F) confirmed contrast (*) extravasation through a full-thickness discontinuity (arrow) of the left ventricular myocardium consistent with complete myocardial rupture. Note hemopericardium (+). Origin: Tonolini M, Department of Radiology, “Luigi Sacco" University Hospital – Milan (Italy)
Description: Coronal (C), sagittal (D), oblique (E) and 3D volume-rendering reconstruction (F) confirmed contrast (*) extravasation through a full-thickness discontinuity (arrow) of the left ventricular myocardium consistent with complete myocardial rupture. Origin: Tonolini M, Department of Radiology, "Luigi Sacco" University Hospital – Milan (Italy)
Description: Coronal (C), sagittal (D), oblique (E) and 3D volume-rendering reconstruction (F) confirmed contrast (*) extravasation through a full-thickness discontinuity (arrow) of the left ventricular myocardium consistent with complete myocardial rupture. Note hemopericardium (+). Origin: Tonolini M, Department of Radiology, “Luigi Sacco” University Hospital – Milan (Italy)
Description: Coronal (C), sagittal (D), oblique (E) and 3D volume-rendering reconstruction (F) confirmed contrast (*) extravasation through a full-thickness discontinuity (arrow) of the left ventricular myocardium consistent with complete myocardial rupture. Origin: Tonolini M, Department of Radiology, "Luigi Sacco" University Hospital – Milan (Italy)
**Description:** Additional venous phase acquisition showed increased opacification of the pericardial effusion (\*) by contrast extravasation through the full-thickness rupture of the left ventricular myocardium (Arrow). Note hemopericardium (+). **Origin:** Tonolini M, Department of Radiology, “Luigi Sacco” University Hospital – Milan (Italy)