A 69-year-old man with a 2-day history of chest pain was admitted to our hospital. His ECG was consistent with acute coronary syndrome (Figure 1A) and troponin I was elevated (>50 ng/mL). Coronary angiography showed a totally occluded circumflex with extensive intraluminal thrombus but no other obstructive disease (Figure 1B). Because the chest pain had completely resolved and this was a late-presentation myocardial infarction, management was medical. Echocardiography on day 6 showed inferolateral wall akinesia (Figure 1C and 1D) but preserved overall left ventricular (LV) function. Cardiovascular magnetic resonance (CMR) imaging 24 hours later to assess for viability showed an area of extreme thinning in the inferolateral wall due to myocardial rupture contained by overlying pericardium (Figure 1E and 1F, arrow, and online-only Data Supplement Movie I). Images acquired early after gadolinium contrast showed a layer of thrombus overlying the area of rupture (Figure 1G, arrow) and extensive no-reflow within the inferolateral wall (Figure 1G, arrowheads). Review of the echo images revealed an area in the inferolateral wall that could be consistent with a myocardial tear but was initially undetected (Figure 1D, arrow, and online-only Data Supplement Movie II). Because the patient was hemodynamically stable, medical management was followed. A repeat CMR scan 8 months later showed mildly impaired LV function (ejection fraction 53%) with preserved volumes. The site of contained rupture had formed a thin fibrous wall with mild dyskinesia (Figure 2A and 2B and online-only Data Supplement Movie III) but no signs of significant adverse remodeling. The patient has been followed-up for over a year now and is doing well, which is in favor of our decision to treat him medically.

The diagnosis of contained LV rupture after acute myocardial infarction can usually be made by echocardiography, although some cases, like ours, may be missed.1 In stable patients, CMR can be particularly useful in differentiating a contained LV rupture with pseudoaneurysm formation from a true aneurysm after myocardial infarction.2,3 A false aneurysm contains no myocardial tissue, is bound by the pericardium, and maintains communication with the LV cavity through a relatively narrow neck. In contrast, true aneurysms represent a bulging of scarred myocardium and have a broad neck that is at least as wide as their maximal diameter. Unlike true aneurysms, which occur more frequently in the anteroapical wall, pseudoaneurysms are most common in the inferolateral wall,4 which may be difficult to image on echocardiography, and CMR is ideal to delineate their anatomic features. On cine CMR images, the exact site of myocardial rupture and pseudoaneurysm formation can be easily detected as an abrupt break in the LV wall contour.2,3 In some cases, it may still be difficult to distinguish these 2 entities on cine images alone, and advanced CMR tissue characterization techniques may prove useful. The identification of marked late gadolinium enhancement of the pericardium, which may extend even beyond the site of rupture, is a common finding in contained LV rupture.3 This is most likely due to chemical irritation of the pericardium by blood released in the acute phase of rupture, causing a focal inflammatory reaction. Although the presence of a mural thrombus is not a good discriminating feature between true and false aneurysms, thrombus formation contributes to containing the rupture but can make the detection of myocardial discontinuity on echocardiography challenging. Cardiovascular magnetic resonance with gadolinium contrast, on the other hand, is superior to echocardiography in the detection of thrombus5 and thus also in the detection of pseudoaneurysms, especially when thrombus is layered against myocardium.

Although there are isolated case reports on the usefulness of CMR in the characterization of pseudoaneurysms2,6 and 1 small prospective study including 4 patients with false aneurysms,3 more large-scale systematic studies are
needed. The primary limitation of CMR is its lack of portability, which makes it less suited for unstable patients with suspected LV rupture. Bedside echocardiography followed by urgent surgical intervention is the only realistic options in such cases. In hemodynamically stable patients, as in our case, medical treatment and frequent follow-up with echocardiography or CMR to monitor LV remodeling may be considered. The wider application of CMR may uncover more frequent cases of asymptomatic contained LV rupture without clinical sequelae.

**Sources of Funding**

The authors wish to acknowledge support from the Oxford NIHR Biomedical Research Centre Programme and the British Heart Foundation Centre of Research Excellence, Oxford, UK. Dr Ferreira acknowledges support from the Alberta Heritage Foundation for
Medical Research and the University of Oxford Clarendon Fund Scholarship.

Disclosures

None.

References


Figure 2. Follow-up CMR scan (8 months after the initial event) showed thinning and scarring in the inferolateral wall (arrow) but no signs of significant adverse remodelling or pseudoaneurysm formation. A, End-diastolic frame of the 3-chamber cine. B, Corresponding late gadolinium enhancement image.
Contained Left Ventricular Rupture After Acute Myocardial Infarction Revealed by Cardiovascular Magnetic Resonance Imaging
Theodoros D. Karamitsos, Vanessa Ferreira, Rajarshi Banerjee, Niall R. Moore, Colin Forfar and Stefan Neubauer