ID: 17-0035; December 2017
DOI: 10.1530/ERP-17-0035

CASE REPORT

Post-myocardial infarction left ventricular pseudoaneurysm diagnosed incidentally by echocardiography

Rienzi Díaz-Navarro[1] and **Petros Nihoyannopoulos**[2]

[1]Departamento de Medicina Interna, Escuela de Medicina, Universidad de Valparaíso, Valparaíso, Chile
[2]Department of Cardiovascular Sciences, Hammersmith Hospital, Imperial College London, NHLI, Hammersmith Hospital, London, UK

Correspondence should be addressed to R Díaz-Navarro
Email
diaz.rienzi@gmail.com

Summary

A 54-year-old male developed a left ventricular pseudoaneurysm (Ps) along the lateral wall of the left ventricle (LV), which was diagnosed incidentally by two-dimensional transthoracic echocardiography (2DTTE) 6 months after an acute myocardial infarction. Color flow imaging (CFI) showed blood flow from the LV into the aneurysmal cavity and invasive coronary angiography revealed sub-occlusion of the circumflex artery. A complementary study using cardiovascular magnetic resonance (CMR) confirmed a dilated left ventricle with depressed ejection fraction, thin dyskinetic anterolateral and inferolateral walls, a Ps adjacent to the lateral wall of the LV contained by the pericardium and blood passing in and out through a small defect in the LV mid-anterolateral wall. Late gadolinium-enhanced imaging demonstrated transmural myocardial infarction in the lateral wall and delayed enhancement of the pericardium, which formed the walls of the Ps. A conservative approach was adopted in this case, optimizing the patient's heart failure medications, including cardioselective beta-blocker agents, angiotensin-converting enzyme inhibitors, spironolactone and chronic anticoagulation therapy because of a high risk of ischemic stroke in these patients. At the 13-month follow-up, the patient remained stable with New York Heart Association class II heart failure. In conclusion, 2DTTE and CFI seem to be suitable initial methods for diagnosing Ps of the LV, but CMR is an excellent complementary method for characterizing further this cardiac entity. Furthermore, the long-term outcome of patients with Ps of the LV who are treated medically appears to be relatively benign.

Key Words

- acute myocardial infarction
- cardiac imaging
- heart failure
- left ventricular pseudoaneurysm
- transthoracic Doppler echocardiography

Learning points:

- Left ventricular pseudoaneurysms are uncommon but severe complications of acute myocardial infarction.
- Transthoracic two-dimensional echocardiography and CFI are suitable non-invasive diagnostic methods for diagnosing left ventricular pseudoaneurysms.
- Cardiac magnetic resonance is an excellent complementary method, as it offers additional information for further characterization of this cardiac complication.
- Despite the fact that surgery is the treatment of choice to avoid a risk of fatal rupture, the long-term outcome of patients with left ventricular pseudoaneurysm who are treated medically appears to be relatively benign.

Background

A pseudoaneurysm (Ps) of the left ventricle (LV) is a severe complication of acute myocardial infarction (AMI) resulting from a free cardiac wall rupture that is contained by the pericardium, thrombus or adhesions (1). Most patients with a cardiac Ps will display symptoms of heart failure, dyspnea or chest pain; however, 10% of such patients can be asymptomatic (2). Two-dimensional transthoracic echocardiography (2DTTE) is a suitable initial method for diagnosing Ps of the LV (3), while color flow imaging (CFI) is a valuable addition to 2DTTE (4). However, cardiac magnetic resonance (CMR) appears to be a promising complementary method for identifying this cardiac entity (5). Early surgical intervention is recommended for Ps of the LV because of its tendency to rupture (6). However, in patients at high risk for surgery, a conservative strategy or percutaneous closure may be preferred (1).

Here we report a patient with Ps who was diagnosed incidentally by echocardiography and has survived 13 months after AMI.

Case presentation

A 54-year-old male was admitted with acute heart failure, which required intensive care management including mechanical ventilation and inotropic support. Electrocardiography showed lateral ST segment elevation, and 2DTTE showed posterolateral akinesis of the LV with depressed ejection fraction (EF). Blood tests confirmed an increased troponin concentration. On physical examination, a systolic–diastolic murmur was noted along the left sternal border. The patient's hospital course was satisfactory, and he was discharged home without any apparent complication.

Investigation

Six months after being discharged from the hospital, the patient developed symptoms of heart failure, being referred to a tertiary hospital for evaluation. On physical examination, the systolic–diastolic murmur was still present. 2DTTE (Fig. 1A) revealed a Ps along the lateral wall of the LV. CFI showed blood flow from the LV into the aneurysmal cavity (Fig. 1B, green arrow; Video 1).

Video 1
Transthoracic Doppler CFI in four-chamber view showing a pseudoaneurysm along the lateral wall of the left ventricle (LV) and turbulent blood flow from the LV into the aneurysmal cavity. View Video 1 at http://movie-usa.glencoesoftware.com/video/10.1530/ERP-17-0035/video-1.

Video 2
Four-chamber view cardiac magnetic resonance imaging confirmed a large pseudoaneurysm adjacent to the lateral wall of the LV, as well as a jet of blood passing from the LV into the pseudoaneurysm cavity in the mid-lateral wall of the LV. View Video 2 at http://movie-usa.glencoesoftware.com/video/10.1530/ERP-17-0035/video-2.

Video 3
Short-axis view cardiac magnetic resonance imaging at the papillary muscle level confirmed the flow from the LV into the pseudoaneurysm cavity through a small LV mid-anterolateral wall defect. View Video 3 at http://movie-usa.glencoesoftware.com/video/10.1530/ERP-17-0035/video-3.

Invasive coronary angiography revealed sub-occlusion of the circumflex artery. Since the patient did not have angina, percutaneous coronary angioplasty of the LCX was not considered by the interventional team. The patient was referred to our hospital for a complementary study with CMR, which confirmed a dilated LV with depressed EF, thin dyskinetic anterolateral and inferolateral walls, a Ps measuring 93 × 62 mm adjacent to the lateral wall of the LV and contained by the pericardium (Fig. 1C), and blood passing in and out through a small mid-anterolateral wall defect in the LV (Fig. 1D & E, yellow arrows; Videos 2 and 3). Late gadolinium-enhanced imaging demonstrated transmural myocardial infarction (MI) in the lateral wall (Fig. 1F, red arrow) and delayed enhancement of the pericardium, which formed the wall of the Ps (white arrows).

Treatment and outcome

This case was presented in a cardiosurgical meeting, opting for medical management as the risks of cardiac surgery were considered to outweighed the benefits. The patient is on treatment with bisoprolol, captopril, spironolactone, atorvastatin and anticoagulation therapy with warfarin. The patient remained stable with New York Heart Association class II heart failure, at the 13-month follow-up.

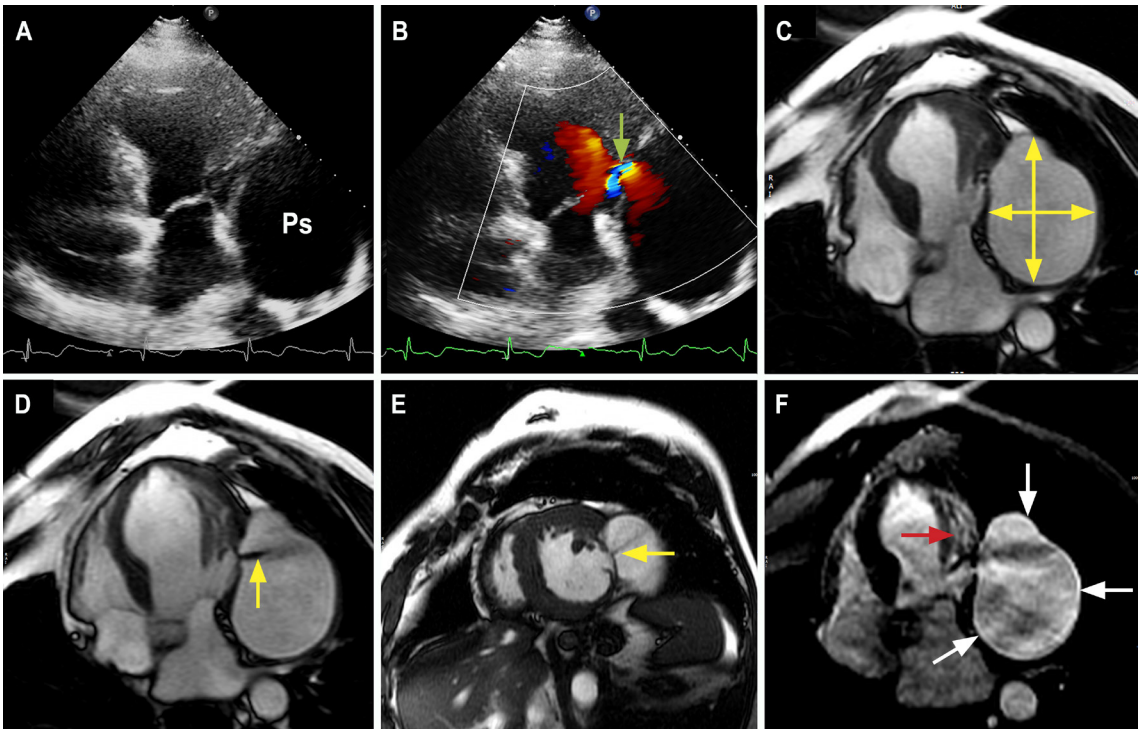

Figure 1
Panel A: transthoracic echocardiogram, four-chamber view showing a pseudoaneurysm (Ps) along the lateral wall of the left ventricle (LV). Panel B: Doppler CFI showing blood flow from the LV into the aneurysmal cavity (green arrow). Panel C: four-chamber view cardiac magnetic resonance imaging confirmed a Ps measuring 93 × 62 mm adjacent to the lateral wall of the LV. Panel D: a jet of blood passing from the LV into the Ps cavity was found in the mid-lateral wall of the LV (yellow arrow). Panel E: short-axis view MRIc at the papillary muscle level confirmed the flow from the LV into the Ps cavity through a small LV mid-anterolateral wall defect. Panel F: late gadolinium-enhanced imaging showed transmural myocardial infarction in the lateral wall (red arrow), as well as delayed enhancement of the pericardium, which formed the wall of the Ps (white arrows).

Discussion

Because Ps of the LV has a high risk of spontaneous rupture and early surgical intervention is recommended, its recognition is of paramount clinical importance (6). 2DTTE and CFI are useful non-invasive methods for revealing the presence of left ventricular Ps, such as that observed in this patient (3, 4). However, CMR provides improved diagnosis and characterization of Ps, particularly in patients with suspected left ventricular Ps with equivocal echocardiographic findings (7). CMR also provides valuable structural and functional information in the preoperative assessment of Ps of the LV (8). A Ps of the LV develops when myocardial rupture is contained by the pericardium, thrombus or adhesions (1). In contrast, true LV aneurysms form following AMI as a result of scar formation and thinning of the myocardial wall (6). 2DTTE and CMR are complementary imaging modalities used to distinguish these two entities (9). CMR is more sensitive and specific for the diagnosis of a Ps of the LV than 2DTT, due to its higher spatial resolution. The presence of delayed enhancement of the pericardium is highly suggestive of a Ps, a feature present in this patient (Fig. 1F) (5). True aneurysms are likely to rupture only in the early post-infarction period and are often managed medically (6). In contrast, a Ps of the LV may rupture regardless its age and size, thus, require surgical repair (6). Therefore, accurate differentiation between the two entities is clinically important, and these imaging techniques may improve patient's outcomes. In this patient, the correct diagnosis was established in a non-invasive manner, which justified the rational use of currently available multimodality cardiac imaging techniques (9).

Although most patients fare well after surgical repair of Ps, with the exception of those who require concomitant mitral valve replacements, the long-term outcome of patients with Ps of the LV who are not treated surgically, also appears to be relatively benign, with a very low risk of fatal rupture (10). Therefore, a conservative approach may be considered in these patients, optimizing heart failure medications, including cardioselective betablocker agents, angiotensin-converting enzyme inhibitors, spironolactone and chronic anticoagulation therapy because of a high risk of ischemic stroke (1, 10).

In conclusion, 2DTTE and CFI are suitable initial methods for diagnosing Ps of the LV, but CMR is an excellent complementary method for further characterization of this cardiac entity. Furthermore, the long-term outcome of patients with Ps of the LV who are treated medically appears to be relatively benign.

Declaration of interest
The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of this case report.

Funding
This work did not receive any specific grant from any funding agency in the public, commercial, or not-for-profit sector.

Patient consent
Written informed consent was obtained from the patient for publication of the submitted article and accompanying images.

Author contribution statement
Rienzi Diaz-Navarro: concept/design, data analysis/interpretation, drafting article, critical revision of article, approval of article, data collection. Petros Nihoyannopoulos: data analysis/interpretation, critical revision of article, approval of article.

References

1 Hulten EA & Blankstein R 2012 Pseudoaneurysms of the heart. *Circulation* **125** 1920–1925. (doi:10.1161/CIRCULATIONAHA.111.043984)
2 Frances C, Romero A & Grady D 1998 Left ventricular pseudoaneurysm. *Journal of the American College of Cardiology* **32** 557–561. (doi:10.1016/S0735-1097(98)00290-3)
3 Catherwood E, Mintz GS, Kotler MN, Parry WR & Segal BL 1980 Two-dimensional echocardiographic recognition of left ventricular pseudoaneurysm. *Circulation* **62** 294–303. (doi:10.1161/01.CIR.62.2.294)
4 Sutherland GR, Smyllie JH & Roelandt JR 1989 Advantages of colour flow imaging in the diagnosis of left ventricular pseudoaneurysm. *British Heart Journal* **61** 59–64. (doi:10.1136/hrt.61.1.59)
5 Konen E, Merchant N, Gutierrez C, Provost Y, Mickleborough L, Paul NS & Butany J 2005 True versus false left ventricular aneurysm: differentiation with MR imaging-initial experience. *Radiology* **236** 65–70. (doi:10.1148/radiol.2361031699)
6 Vlodaver Z, Coe JI & Edwards JE 1957 True and false left ventricular aneurysms. Propensity for the latter to rupture. *Circulation* **51** 567–572. (doi:10.1161/01.CIR.51.3.567)
7 Harrity P, Patel A, Bianco J & Subramanian R 1991 Improved diagnosis and characterization of postinfarction left ventricular pseudoaneurysm by cardiac magnetic resonance imaging. *Clinical Cardiology* **14** 603–606. (doi:10.1002/clc.4960140713)
8 Varghese A, Pepper J & Pennell DJ 2005 Cardiovascular magnetic resonance of left ventricular pseudoaneurysm. *Heart* **91** 477. (doi:10.1136/hrt.2004.039768)
9 Mousavi N, Buksak R, Walker JR, Hussain F, Pascoe E, Kirkpatrick ID & Jassal DS 2009 Left ventricular pseudoaneurysm: the role of multimodality cardiac imaging. *Canadian Journal of Cardiology* **25** 389. (doi:10.1016/S0828-282X(09)70168-0)
10 Moreno R, Gordillo E, Zamorano J, Almeria C, Garcia-Rubira JC, Fernandez-Ortiz A & Macaya C 2003 Long term outcome of patients with postinfarction left ventricular pseudoaneurysm. *Heart* **89** 1141–1146. (doi:10.1136/heart.89.10.1144)

Received in final form 23 August 2017
Accepted 12 September 2017