Additional value of cardiovascular magnetic resonance for investigating the cause of heart failure

Valeur ajoutée de l’IRM cardiovasculaire dans le diagnostic étiologique de l’insuffisance cardiaque

Jérôme Garot*, Jean-Yves Tabet, Yves Louvard

ICPS, service d’IRM cardiovasculaire, institut hospitalier Jacques-Cartier, 6, avenue du Noyer-Lambert, 91300 Massy, France

Received 21 July 2008; accepted 21 July 2008
Available online 23 September 2008

A 78-year-old man was referred for refractory heart failure. He presented in NYHA class IV with bilateral pleural effusion and peripheral oedema. He was on angiotensin-converting enzyme inhibitors, furosemide, and aldosterone blockade; beta-blockers were withdrawn at the time of decompensated heart failure. His blood pressure was 100/70 mmHg and his heart rate was 89 beats/min in sinus rhythm. The 12-lead electrocardiogram showed microvoltage and negative T waves in V2 to V5. Transthoracic echocardiography revealed a severely hypokinetic, non-dilated, non-hypertrophied left ventricle (end-diastolic diameter 56 mm, wall thickness 11 mm, and ejection fraction 25% according to the biplane Simpson method), two enlarged atria, a restrictive filling pattern on Doppler transmitral inflow (E/A < 1), 70-mmHg systolic pulmonary arterial pressure, and enlarged inferior vena cava and sushepatic veins.

The patient underwent cardiovascular magnetic resonance (CMR) (1.5 T Siemens Symphony®, Erlangen, Germany) for etiological and prognostic purposes. Cine-CMR confirmed the echocardiographic data (panels A and B in the Fig. 1, and supplemental movie file). Dynamic first-pass perfusion CMR showed delayed homogeneous myocardial first-pass perfusion. Ten minutes after gadolinium injection (0.1 mm Dotarem®, Guerbet, Aulnay, France) selection of the inversion time on a dedicated multiphase sequence (TI scouting, Look Locker) was very difficult because of diffuse circumferential subendocardial enhancement and a small amount of preserved

* Corresponding author.
E-mail address: j.garot@icps.com.fr (J. Garot).

1875-2136/$ – see front matter © 2008 Elsevier Masson SAS. All rights reserved.
doi:10.1016/j.acvd.2008.07.003
Figure 1. Still frames extracted from cine CMR (steady state free precession) in the four-chamber view at (A) end-systole and (B) end-diastole, confirming the echocardiographic data (non-dilated, non-hypertrophied left ventricle, 25% ejection fraction, dilated atria, pleural effusion, moderate tricuspid and mitral regurgitations). Late-enhanced inversion-recovery CMR images show left-ventricular diffuse subendocardial hyperenhancement in the (C) four-chamber, (E) two-chamber, and (F) short-axis views. A consistent finding was observed when using the phase-sensitive inversion-recovery sequence in the (D) four-chamber view. Note that the right ventricle is most likely to be involved.

subepicardial rim (supplemental movie file). Late contrast-enhanced CMR showed diffuse circumferential subendocardial enhancement with a preserved subepicardial rim (panels C–F in the Fig. 1), highly suggestive of cardiac amyloidosis. Amyloid proteins are known to accumulate preferentially in the subendocardium with respect to the subepicardium. The diagnosis of cardiac amyloidosis was confirmed on laboratory testing and biopsy. The patient’s clinical outcome was poor.

This case highlights the incremental value of CMR over echocardiography for the diagnosis of cardiac amyloidosis in patients with heart failure. The patterns of late enhancement are very specific for the disease. CMR should be
performed in patients for whom the diagnosis is still uncertain after conventional work-up.

**Conflict of interest**

No conflict of interest to disclose for all authors with regard to the manuscript.

---

**Appendix A. Supplementary data**