Cardiac Magnetic Resonance and Dual-source CT Detect Lipomatous Metaplasia of Left Ventricle in Chronic Myocardial Infarction

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Introduction: The histological evolution of myocardial infarction has been studied in some detail. At autopsy, however, 68% of scars associated with chronic ischemic heart disease have shown lipomatous metaplasia in the scar. So we use cardiac magnetic resonance (CMR) and dual-source CT to detect fatty tissue to confirm the morphologic change.

Methods: 11 patients (8 males, 3 females, 52-74 years old, average 64 years old) with a history of previous myocardial infarction and dual-source CT demonstration of fatty change in left ventricle underwent CMR examinations.

Results: Of the 11 patients examined, 8 cases of lipomatous metaplasia were identified by CMR (72.7%); the infarctions happened 5 months-28 years ago, 5 patients had PTCA+stent therapy, 2 patients had CABG and 1 patient by medicine alone. In 5 cases (62.5%), the thickness of the fatty tissue less than half of the scar.

ECG-gated 1.5T cine-CMR (steady-state free precession) showed wall thinner and akinesia or hypokinesia of the anterior or inferior wall. Before contrast injection, these segments exhibited a heterogeneous signal on cine-CMR, with a high signal component in the central surrounded by a low signal border (Panels a, b, and c). Non-contrast black-blood T1-weighted spin echo images revealed a high signal in the anterior wall (Panel d), along with dramatic signal decay after fat saturation (Panels e and f), indicating the presence of intramyocardial fat. Delayed-enhanced images (LCE) acquired 10 min after Gd-DTPA (0.1 mmol/kg) revealed late hyper enhancement in infarct territories. CT plan scan (Panels A, B) and ECG-gated coronary CT (Panels C, D) showed hypodensity (-80 HU) in the anterior wall, indicating fatty infiltration, the location and extent consistent with CMR findings. The CT value varies from -56 to -113 HU.

Conclusion: 1 A high signal intensity on LCE images may not always represent fibrosis alone but lipomatous metaplasia in regions of old myocardial infarction. 2 The presence of fat supports the speculation that a regenerative cell, or multipotent stem cell, exists within the heart, and under the influence of microenvironmental or therapeutic factors can differentiate into fat, other mesenchymal tissues, and potentially even myocardium. 3 As technology improves, lipomatous metaplasia may be observed in old myocardial infarctions and may be depicted by CMR and dual-source CT. Although comprehensive CMR has a unique value for tissue characterization of the myocardium and fat imaging, dual-source CT is well suited for detection of fatty infiltration in infarcted myocardium, in addition to its value for non-invasive coronary angiography.

Key Words: Cardiac magnetic resonance, dual-source CT, lipomatous metaplasia, myocardium