

CLINICAL CASE REPORT

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Cardiovascular Magnetic Resonance for Visualization of Myocardial Ischemia at Rest

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Key words: cardiovascular magnetic resonance; myocardial ischemia; coronary artery disease.

Summary. This article presents the case of a 54-year-old male with evidence of myocardial ischemia at rest. In our case, by means of cardiovascular magnetic resonance, myocardial ischemia at rest in theoretical left anterior descending artery territory was proved, myocardial scar was excluded, and need for revascularization was validated.

Introduction

We present a case of resting myocardial ischemia and shortly discuss the value of cardiovascular magnetic resonance (CMR) for the assessment of rest and stress ischemia especially in case when coronary artery stenosis is of unclear significance.

Case Report

A 54-year-old male was admitted to the Vilnius University Hospital Santariškių Klinikos because of typical angina pectoris during minimal physical activity and at night.

From the age of 48 years, the patient suffered from arterial hypertension and angiospastic angina pectoris with normal coronary arteries on conventional angiography (COG) and normal left ventricular (LV) function on echocardiographic examination. Treatment with calcium channel blockers was effective. At the age of 54 years, the patient experienced renewed angina pectoris during physical activity. He was treated in our hospital; COG showed minimal changes: 50% stenosis in the first diagonal branch of the left anterior descending artery (LAD). Treatment with calcium channel blockers was continued. Echocardiogram and electrocardiogram (ECG) were without significant pathological changes.

In two weeks after the abovementioned hospitalization, the patient was repeatedly admitted to our hospital because of exacerbation of angina pectoris with a frequent need for nitrates. Initial ECG revealed a sinus rhythm (80 bpm) with the electrocardiographical features of left ventricular hypertrophy. Serial troponin I tests showed negative results. The repeated echocardiogram showed diminished LV ejection frac-

tion of about 45% and mild hypokinesis in the antero-septal wall. Because of previous equivocal findings on COG in order to confirm inducible ischemia, stress CMR (1.5 T Siemens Avanto) was scheduled. Rest short-axis cine MR imagining showed akinesis in the antero-septal and anterior walls at the midventricular level and hypokinesis in the anterior and lateral walls at the apical level (Fig. 1). A rest perfusion MR scan revealed a nearly transmural perfusion defect in the midventricular segments of the anterior and antero-septal walls and in the apical segment of the anterior wall (Fig. 2A). On late gadolinium enhancement (LGE) images 15 minutes after contrast medium injection, no contrast enhancement in the LV was noted (Fig. 2B). Findings on CMR scan showed ischemia in theoretical LAD territory at rest; therefore, a stress test was postponed. COG was performed, and this time, a significant stenosis of about 85% was noted in the first diagonal branch of the LAD (Fig. 3). The patient underwent successful primary stenting of the first diagonal branch of the LAD.

Discussion

The management of patients with chest pain is a common and challenging clinical problem. Multiple imaging strategies have been used to accelerate the diagnosis and to provide further risk stratification in patients with no initial evidence of acute coronary syndrome.

In our case, not only various noninvasive tests such as bicycle exercise testing, bicycle exercise echocardiography, dobutamine stress echocardiography, single-photon emission computed tomography, vasodilator perfusion CMR, or dobutamine

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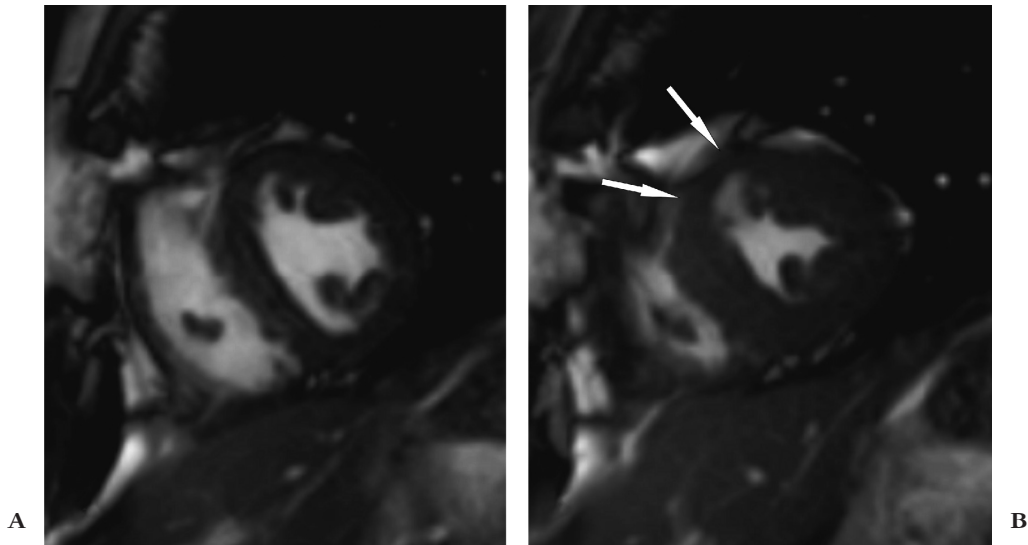


Fig. 1. Short-axis cine magnetic resonance images (SSFP sequence) at rest at the midventricular level in end-diastole (A) and end-systole (B). Akinesis in the anteroseptal and anterior segments was observed (please note the absence of the thickening of anterior and anteroseptal segments in end-systole [arrows]).

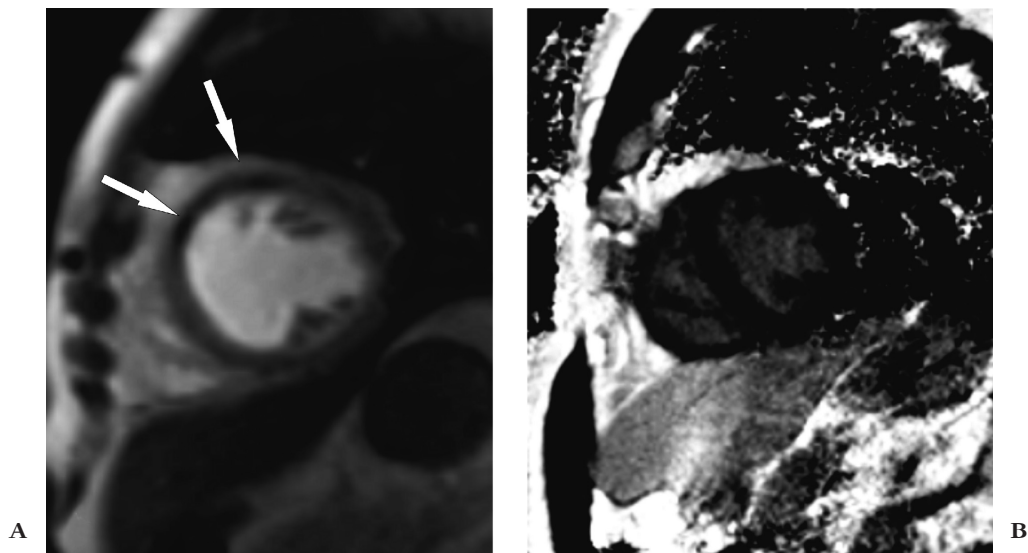


Fig. 2. The rest perfusion magnetic resonance image (A) shows a nearly transmural hypointense perfusion defect in the anterior wall at the midventricular level (arrows), and on late enhancement image 15 minutes after contrast media injection (inversion recovery sequence) (B), no late gadolinium contrast hyperenhancement was noted at the corresponding slice as in (A).

stress function CMR, but also myocardial fractional flow reserve measured invasively could be used in order to assess inducible ischemia and to validate the need for revascularization. According to our expertise, CMR was chosen because of its capability for combined assessment of function, perfusion, and LGE, safety for the patient, high sensitivity and specificity for detecting a relevant coronary stenosis in patients with suspected coronary artery disease and its ability to exclude another pathology (e.g., myocarditis, aortic disease, etc.). A noninvasive stress test before invasive procedure was chosen because of previous equivocal findings on COG.

The combination of CMR function, stress perfusion, and LGE allows for the use of CMR as a primary form of testing for the following: 1) identifying the patients with ischemic heart disease when resting ECG abnormalities or inability to exercise are present; 2) defining the patients with large-vessel coronary artery disease and its importance for candidates for interventional procedures; or 3) determining the patients who are appropriate candidates for interventional procedures (1). According to the appropriateness criteria for CCT/CMR (2), vasodilator perfusion CMR or dobutamine stress function CMR is a generally acceptable and reasonable ap-



Fig. 3. Coronary angiograms showing significant stenosis in the first diagonal branch of the left anterior descending artery (arrow, A) and good angiographic results after primary stenting of the first diagonal branch of the left anterior descending artery (arrow, B)

proach for the assessment of coronary stenosis, the significance of which is unclear after coronary angiography (catheterization or computed tomography).

The combination of CMR perfusion and LGE assessment for detecting a relevant coronary stenosis in patients with suspected coronary artery disease yielded a sensitivity and a specificity of 0.94 and 0.87; in PCI patients, 0.91 and 0.90; and in CABG

patients, 0.79 and 0.77, respectively (3).

In our case, CMR was capable of proving rest ischemia in theoretical LAD territory, excluding a myocardial scar, and validating the need for revascularization.

Statement of Conflict of Interest

The authors state no conflict of interest.

Miokardo išemija ramybėje: širdies ir kraujagyslių sistemos magnetinio rezonanso reikšmė

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Raktažodžiai: širdies ir kraujagyslių sistemos magnetinis rezonansas, miokardo išemija, išeminė širdies liga.

Santrauka. Straipsnyje analizuojamas 54 metų vyro, kuriam diagnozuota miokardo išemija ramybėje, klinikinis atvejis. Atlikus širdies ir kraujagyslių sistemos magnetinio rezonanso tomografiją, šiam pacientui buvo patvirtinta miokardo išemija ramybėje teoriniame priekinės nusileidžiančiosios arterijos baseine, atmetas miokardo randinių pokyčių įtarimas bei pagrįstas revaskulizacijos būtinumas.

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