PET Assessment of Myocardial Viability Following AMI. Significance of Reverse Mismatch Pattern

To the Editor:

Positron emission tomography (PET) is currently the reference technique for determining whether viable myocardium is present because it is the only one that can use specific tracers for both flow ($^{13}$NH$_3$) and cardiac metabolism ($^{18}$FDG). The following basic patterns for diagnosis of viable myocardium have been established$^{1,2}$:

- Match pattern: low uptake of both tracers, suggestive of lack of viability in the necrotic region.
- Mismatch pattern: flow is reduced but metabolism is maintained, suggestive of viability in the necrotic area.

In this letter to the editor, we present the case of a 72-year-old patient with cardiovascular risk factors (dyslipidemia and a smoking habit), who was admitted to hospital for unstable angina. Anterior acute myocardial infarction (AMI) was diagnosed and treated with fibrinolytic agents. Catheterization revealed atheromatosis with multiple insignificant lesions and a lesion involving 90% of the middle left anterior descending (LAD) artery. According to the ventriculogram, severe anterolateral hypokinesia was present, with an ejection fraction (EF) of 67%.

The LAD artery was stented in a percutaneous transluminal coronary angioplasty procedure. The echocardiogram on discharge showed that the left ventricle was not dilated and that wall motion was normal (EF, 64%).

Thirty days post-AMI, myocardial viability was studied with $^{18}$FDG as a tracer and correlated with regional flow alterations measured with $^{13}$NH$_3$, as a tracer. The findings of the study of flow with $^{13}$NH$_3$ were almost normal, whereas decreased metabolism in the necrotic area was seen in the study with $^{18}$FDG (reverse mismatch pattern) (Figure 1).

After 1 year, the patient had suffered no further acute coronary episodes. He underwent a single-photon emission computed tomography control study of the myocardium with $^{99m}$Tc-tetrofosmin (8 mCi/22 mCi) and an exercise test with the cycle ergometer. The findings of exercise testing proved clinically and electrically negative, although the test was limited to 75% of maximum because of the effect of treatment with carvedilol (50 W; 4.3 MET). Anterior necrosis was documented in the myocardial perfusion study, with involvement of the apical and medial segments and no viable tissue or signs of proximal or distal ischemia (Figure 2).

Despite necrosis, the patient had normal coronary flow with low glucose uptake, a pattern that has been described as reverse mismatch. The pathophysiology of this condition seems to be multifactorial. Mechanisms such as dissolved fragments of thrombi causing microinfarction of distal vessels, use of other substrates during the acute phase of AMI, relative hyperemia, and the development of collateral vessels are all potentially implicated.$^3$

The few studies that have been done on the reverse mismatch pattern have enrolled different types of patient. Nevertheless, the literature points to a prevalence of almost 30%.$^4$ Myocardial histology was investigated in an animal model of myocardial infarction, and patchy necrosis was found in which a transmural area and mixture of myocardial fibrosis and viable tissue were observed, with structural alterations of the cardiomyocytes at the edges of the microinfarction.$^5$
In conclusion, the reverse mismatch pattern, in which flow and cardiac metabolism (decreased metabolism) do not correlate, should be interpreted as “threatened” tissue that is probably unrecoverable when associated with patchy necrosis.

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Aortic Insufficiency of Unusual Etiology Susceptible to Surgical Repair

To the Editor:

Interest in surgical repair techniques as an alternative to valve replacement has been revived by improved knowledge of valve diseases and the possibility of more accurate assessment of their severity and origin with noninvasive techniques. Mitral valve replacement surgery is used systematically, but surgeons have less experience with the aortic valve.

This letter presents the case of successful repair of valve prolapse that was causing aortic regurgitation, with particular emphasis on the use of echocardiography for diagnosis and evaluation of the outcome of surgery.

Our patient was a 62-year-old man diagnosed with severe asymptomatic aortic valve regurgitation. He did not meet the echocardiographic criteria for surgery and he had presented with grade II/IV dyspnea in the previous few months. Further echocardiographic assessments revealed an aortic valve with thin leaflets that opened normally but showed extensive right-coronary leaflet prolapse during diastole, giving rise to an off-center regurgitation jet flowing towards the anterior mitral valve. The jet was more than 12 mm wide in the long-axis parasternal view, exceeded more than 50% of the diameter of the left ventricular outflow tract, and had a vena contracta of 8 to 9 mm and a large proximal isovelocity surface area. The left-ventricular end-diastolic diameter was 45 mm (26.47 mm/m²) and the ejection fraction was 66%. The diameter (19.41 cm/m²) and structure of the ascending aorta were normal. Holodiastolic flow reversal was found in the pulsed Doppler examination. A transesophageal echocardiogram was done to assess the possibility of surgical repair. Prolapse of the right coronary cusp was observed in the transverse midesophageal view at 63º, with the leaflet appearing elongated and thin, whereas the other leaflets showed no signs of calcification and appeared normal (Figure 1A). The color-Doppler images showed a region of severe regurgitation (1.47 cm²) (Figure 1B). The remaining images added no further information to that obtained from the transthoracic echocardiogram. The anatomic structure of the aortic valve was such that surgical repair could be done by triangular resection and plication of the right coronary leaflet. According to intraoperative transesophageal echocardiography (blood pressure, 90/60 mm Hg; heart rate, 50 beats/min), no prolapse was present (Figure 2A), but a minimal central jet of grade I/IV could be discerned (Figure 2B). No complications arose after the operation. The findings of a further echocardiographic examination after 6 months were similar to those of the postoperative control. The patient was stable, and in New York Heart Association functional class I.

Figure 1. Transesophageal echocardiography, transversal view at 63º. Prolapse of the right coronary cusp (A). Severe aortic regurgitation detected with color-Doppler imaging (B).