A 43-year-old man with type 2 diabetes mellitus was referred for cardiovascular risk assessment 2 years ago. Other risk factors for coronary artery disease included hypercholesterolemia, smoking, and a family history of coronary artery disease.

The patient was asymptomatic. Physical examination was unremarkable; his body mass index was 22 kg/m² and his blood pressure was 125/80 mm Hg. Hypercholesterolemia was well regulated with statin administration (total cholesterol 3.52 mmol/L, low-density lipoprotein cholesterol 2.23 mmol/L, high-density lipoprotein cholesterol 0.94 mmol/L). ECG showed normal sinus rhythm and no additional abnormalities (Figure 1).

Myocardial perfusion imaging was performed with gated single-photon emission computed tomography (SPECT) using technetium-99m sestamibi (500 MBq). Pharmacological stress was induced with adenosine; the stress ECG showed no abnormalities. On gated SPECT, left ventricular ejection fraction was 68% during stress as well as at rest; myocardial perfusion imaging revealed no perfusion abnormalities during stress or at rest (Figure 2).

In addition, no coronary calcium was observed during calcium scoring (total coronary calcium score 0). However, contrast-enhanced multislice computed tomographic coronary angiography revealed the presence of diffuse nonobstructive (<50% luminal narrowing), noncalcified plaques, as illustrated in Figure 3. Risk factor modification was advised (exercise, stop smoking) and aggressive medical therapy was initiated (administration of aspirin, statins, and an ACE inhibitor).
Two years after the index evaluation, the patient was evaluated at the outpatient clinic. He was asymptomatic, but the ECG revealed new development of negative T waves in leads II, III, aVF, V5, and V6 (Figure 4). Accordingly, myocardial perfusion imaging SPECT was repeated and showed a large irreversible defect in the inferolateral wall, with partial reversibility in the inferior wall (Figure 5). Resting echocardiography showed hypokinesia in the inferolateral regions with moderate (grade 2+) mitral regurgitation.

To evaluate the extent of infarcted myocardium, contrast-enhanced (gadolinium) MRI was performed (Figure 6) and revealed subendocardial infarction in the inferolateral wall. The resting cine MRI short-axis slices confirmed hypokinesia in the inferolateral regions (online Movie 1).

On the basis of these imaging results, the patient was referred for invasive coronary angiography, which revealed a proximal occlusion of the right coronary artery with retrograde filling from the left anterior descending coronary artery (online Movies 2 and 3). Accordingly, the patient was scheduled for percutaneous coronary intervention.

Screening of asymptomatic patients who have type 2 diabetes mellitus for silent coronary artery disease is a heavily debated topic. Despite early identification of atherosclerosis and subsequent risk factor modification with aggressive medical therapy, infarction occurred 2 years later.

These findings emphasize, on the one hand, the need for risk stratification (preferably with noninvasive imaging) in asymptomatic diabetic patients, but on the other hand, that the current imaging techniques are imperfect for prediction of events. We have imaging techniques that provide highly accurate information on stress-inducible ischemia. It is clear that patients with ischemia have an increased risk for
future cardiovascular events, and invasive evaluation (with possible intervention) is needed. This patient, however, had normal myocardial perfusion imaging results while at stress and rest.

More recently, techniques have become available that permit early identification of atherosclerosis (calcium scoring) and also provide preliminary information on plaque composition (multislice computed tomographic angiography). In this patient, calcified plaques were not present, but noncalcified lesions were observed. Recent preliminary data indicate that noncalcified plaques are associated with acute coronary syndromes and suggest relatively high vulnerability of these plaques. These noncalcified plaques were the only substrate underlying the recent myocardial infarction. This highlights the potential value of modern imaging technology, but at the same time, it illustrates that better understanding of plaque vulnerability is needed to develop imaging for optimal risk stratification in asymptomatic diabetic patients.

Disclosures

Dr Bax has research grants from GE Healthcare, BMS Medical Imaging, St. Jude, Boston Scientific, Edwards Lifesciences, and Medtronic. The other authors report no conflicts.

References

Figure 5. Repeat SPECT myocardial perfusion imaging was performed 2 years after the index SPECT (Figure 2) was obtained. Presentation of slices are as in Figure 2. An irreversible defect is shown in the inferolateral region (thick arrows), whereas reversibility is demonstrated in the inferior wall (thin arrows).

Figure 6. Contrast-enhanced MRI; short-axis slices are shown. Evidence of subendocardial scar tissue is revealed (arrows).
The Difficulty of Adequate Risk Stratification for Patients With Asymptomatic Diabetes
A.J.H.A. Scholte, J.D. Schuijf, M.P. Stokkel, A. de Roos and J.J. Bax

_Circulation_. 2008;118:e65-e68
doi: 10.1161/CIRCULATIONAHA.107.764001
_Circulation_ is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2008 American Heart Association, Inc. All rights reserved.
Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the
World Wide Web at:
http://circ.ahajournals.org/content/118/3/e65

Data Supplement (unedited) at:
http://circ.ahajournals.org/content/suppl/2008/12/01/118.3.e65.DC1