Atypical Exercise Stress Myocardial Perfusion SPECT Imaging in a Patient With Effort Angina Pectoris

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Exercise or pharmacological stress myocardial perfusion single-photon emission computed tomography (SPECT) has been used in daily clinical practice as a reliable diagnostic modality and a prognostic marker for patients with coronary artery disease.1-3 We herein report atypical exercise stress myocardial perfusion SPECT imaging in a patient with effort angina pectoris.

A 58-year-old male who had felt anterior chest pain during walking was referred to our hospital. He was suspected of having effort angina pectoris, and he underwent exercise stress/rest myocardial perfusion SPECT with a dual-isotope protocol using $^{201}$Tl at rest and $^{99m}$Tc-tetrofosmin for stress imaging. Stress SPECT imaging showed a reduced tracer accumulation only in the basal anterior segment, including the anterolateral and a part of the anteroseptal segments (Figure 1A, black triangles). Rest imaging did not show reduced tracer accumulation in any segments, thus suggesting myocardial ischemia in the basal anterior wall. Coronary angiography was then carried out. The right coronary angiograms did not show any significant stenosis (Figure 2A). The

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Figure 1. Exercise stress myocardial perfusion single-photon emission computed tomography images (A) before and (B) 1 year after the percutaneous coronary intervention (PCI). Reduced tracer accumulation in the basal anterior segment after exercise (black triangles) is clearly documented in the images before the PCI. In contrast, reduced tracer accumulation after exercise is not observed in any segments 1 year after the PCI.
Atypical SPECT Imaging in AP

distal portion of the right coronary artery branched to the left lateral wall. The right coronary angiograms also indicated an anomalous transverse vessel arising from the ostium of the right coronary artery (Figures 2B and 2C, white arrows, and Movie 1). The anomalous vessel showed a gentle takeoff from the right coronary artery, and the multiple-angle view revealed that the vessel was located in front of the pulmonary artery. The vessel connected with the mid-portion of the left anterior descending coronary artery (LAD), which had a 90% stenosis on the basal side of the anastomosis (Figures 2B and 2C, white triangles, and Movie 1). Ascending aortograms did not reveal any traces of ostium of the left coronary arteries. These findings denote a single coronary artery. This patient later underwent percutaneous coronary intervention (PCI), and the stent implantation at the stenotic site was successful (Figure 2D, black triangle, and Movie 2). Exercise stress myocardial SPECT imaging (99mTc-tetrofosmin) 1 year after the PCI did not show a reduced tracer accumulation in any segments (Figure 1B). Six years after the PCI, the patient continued to feel well without any angina-like symptoms.

In the present SPECT findings, myocardial perfusion was reduced after exercise, but only in the basal anterior segment. Isolated basal anterior ischemia might be caused by a stenotic lesion in the diagonal branch arising from the proximal LAD; however, this does not fit our present case because the reduced tracer accumulation was seen not only in the anterolateral, but also in a part of the anteroseptal segment. On the other hand, basal anterior ischemia due to a proximal LAD lesion is usually accompanied by mid- to apical-anterior ischemia, because of the anatomical features of the LAD. Therefore, the present SPECT findings cannot be fully explained by either the LAD or diagonal branch lesion under conditions of a normal coronary anatomy, thus indicating that the present SPECT findings are ‘atypical’. Coronary angiograms showed a single coronary artery with an anomalous transverse vessel arising from the ostium of the right coronary artery, which connected with the mid-portion of the LAD. Lipton et al proposed the classification of a single coronary artery according to the site of origin and anatomical distribution of the branches. The present case corresponds to the anatomical features of the RII-A type proposed by Lipton et al, with the exception of the connection site of the anomalous vessel with the LAD. In the LAD, the blood flowed toward the basal side from the anastomosis of the anomalous vessel, and the blood stream passed through the site of stenosis. These angiographical findings can clearly explain the SPECT results.

An anomalous coronary artery is reported to be seen in approximately 5.6% of patients who receive coronary angiography. Cardiologists should keep in mind that atypical stress myocardial perfusion SPECT imaging might result from an anomalous coronary artery, including the presence of a single coronary artery, accompanied by significant coronary stenosis.

Disclosures

None.

References


**Supplementary files**

**Movie 1.** Coronary angiogram showing anomalous transverse vessel and significant stenosis on the basal side of the anastomosis in the left anterior descending coronary artery.

**Movie 2.** Coronary angiogram showing successful stent implantation at the site of the lesion.

Please find supplementary file(s):