

SPECT-CT of a Noncalcified Atherosclerotic Coronary Plaque

To the Editor:

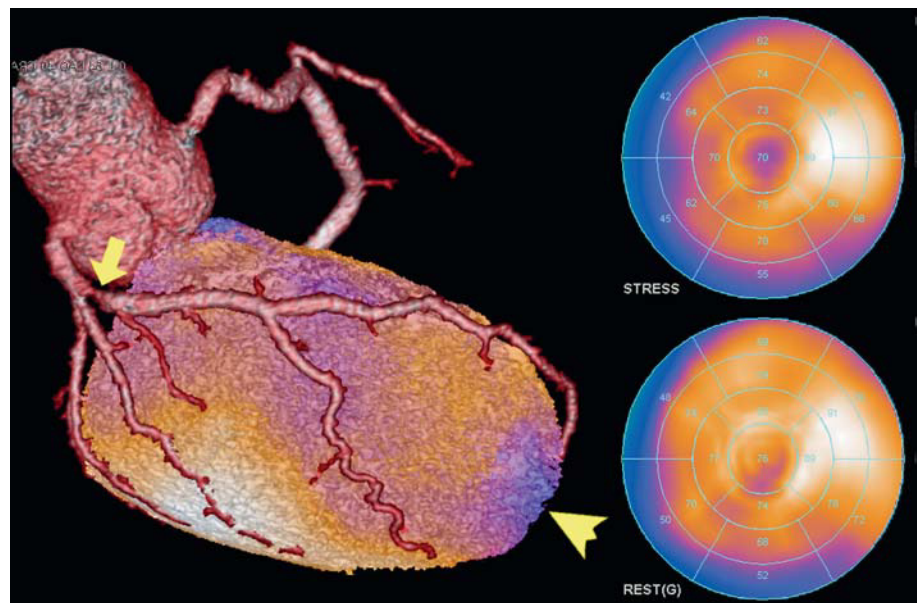
We present the case of a 62-year-old patient with a history of mild hypertension and prolonged chest pain on rest. The physical examination, ECG and markers of myocardial damage were all normal. He performed a maximum exercise stress test, which was clinically negative but showed borderline electrocardiographic changes. He then underwent stress and resting synchronized myocardial perfusion single photon emission computed tomography (SPECT), which showed mild septal and reversible anteroapical perfusion. The ejection fraction and the ventricular volumes were normal. Cardiac computed tomography (CT) was done in 2 stages: first, calcium was quantified, and absence of calcified atheromatous lesions was noted. Following this, the CT coronary angiogram with cardiac synchronization showed an isolated, non-calcified atheromatous lesion at the

origin of the anterior descending artery that was causing the severe stenosis. The atheromatous plaque had attenuation values near 20 HU, with a concentric morphology and positive remodeling.

Three-dimension fusion of CT and SPECT (Figure 1) transposed the perfusion data from the stress SPECT onto the volume reconstruction of the CT with the data obtained with independent CT and SPECT devices at two different sessions.¹ A single combined image showed the anatomic lesion (yellow arrow) and its functional repercussion in the form of hypoperfusion, corresponding to the territory of the anterior descending artery (yellow arrowhead). Given these results, the patient underwent cardiac catheterization, which confirmed the results of the CT (Figure 2). Angioplasty of the anterior descending artery was performed with implantation of a stent.

This case illustrates the usefulness of fusing cardiac SPECT and CT images for the anatomic and functional evaluation of patients with symptoms and/or a doubtful ergometric test. Cardiac CT detects atherosclerotic disease with great sensitivity, and excludes it with an excellent negative predictive value, despite the fact that it is unable to discriminate subclinical disease of the lesions with functional repercussions.¹ These characteristics are complementary to myocardial perfusion SPECT and strengthen its diagnostic efficacy.² In spite of the possible usefulness of quantification of calcified coronary plaque for cardiovascular risk stratification, it is important to note that the absence of coronary calcium does not exclude the presence of important coronary disease.³ It is estimated that two thirds of acute coronary syndromes are related with non-calcified plaque rupture or ulceration, with a similar morphology to that described in this case.⁴

Figure 1. Computed tomography fusion image from single-photon emission and computed tomography showing stress perfusion transposed on to the left ventricular volume, as well as the coronary tree and the aortic root. Note the stenosis at the origin of the anterior descending artery (yellow arrow), with no visible calcified plaque, as well as anteroapical hypoperfusion adjacent to the distal vascular segment (yellow arrowhead). The perfusion polar maps at stress (stress) and rest (rest) show the partial reversibility of the discrete hypoperfusion.



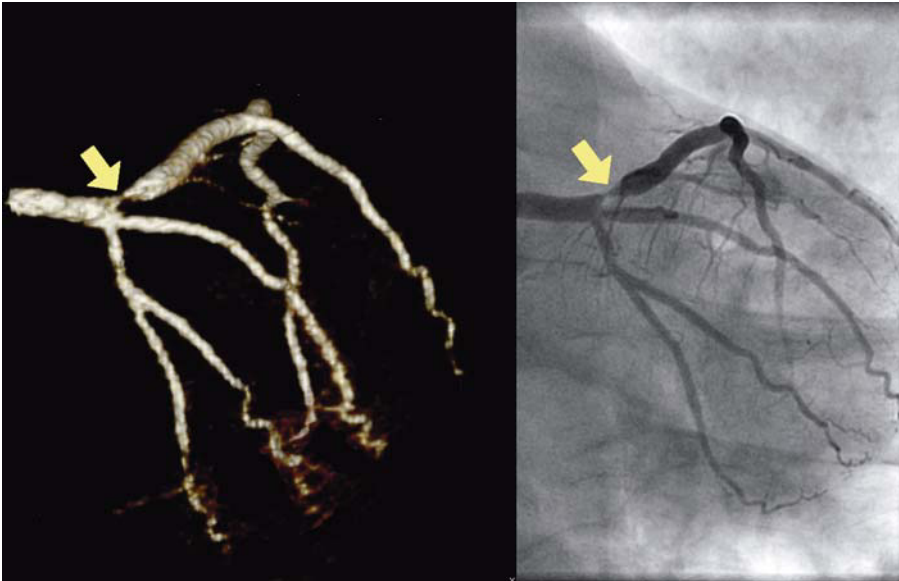


Figure 2. Comparison of the volume image of the left coronary tree taken from the computed tomography with the projection of the coronary angiogram. Note the similar morphology of the stenosis (yellow arrows) in the 2 techniques, in spite of the lower spatial and temporal resolution of the tomography.

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REFERENCES

1. García MJ, Lessick J, Hoffmann MH; CATSCAN Study Investigators. Accuracy of 16-row multidetector computed tomography for the assessment of coronary artery stenosis. *JAMA*. 2006;296:403-11.
2. Gaemperli O, Schepis T, Valenta I, Husmann L, Scheffel H, Duerst V, et al. Cardiac image fusion from stand-alone SPECT and CT: clinical experience. *J Nucl Med*. 2007;48:696-703.
3. Rubinshtein R, Gaspar T, Halon DA, Goldstein J, Peled N, Lewis BS. Prevalence and extent of obstructive coronary artery disease in patients with zero or low calcium score undergoing 64-slice cardiac multidetector computed tomography for evaluation of a chest pain syndrome. *Am J Cardiol*. 2007;99:472-5.
4. Motoyama S, Kondo T, Sarai M, Sugiura A, Harigaya H, Sato T, et al. Multislice computed tomographic characteristics of coronary lesions in acute coronary syndromes. *J Am Coll Cardiol*. 2007;50:319-26.