Myocardial Perfusion SPECT in Right Bundle Branch Block and Left Anterior Hemiblock

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The aim of this study was to determine the diagnostic accuracy of myocardial perfusion SPECT (single photon emission computed tomography) with technetium labeling in patients with right bundle branch block (RBBB) and with left anterior hemiblock (LAH). One hundred seven patients (53 RBBB, 54 LAH) for whom coronary angiography results were available were selected. The gold standard for diagnosis was based on two coronary angiography criteria:

a) Stenosis equal to or greater than 50% in at least one coronary artery, and
b) Completely normal coronary angiography.

The sensitivity of SPECT was approximately 90% in both RBBB and LAH. Specificity was 58% and 50%, respectively, for the first criterion, but was 85.7% and 87.5%, respectively, for the second criterion.

Key words: Scintigraphy. Right bundle branch block. Left anterior hemiblock. Coronary heart disease.

INTRODUCTION

Stress myocardial SPECT (single photon emission computed tomography) is a high precision diagnostic test for coronary heart disease. However, in patients with left bundle branch block (LBBB) specificity is limited due to low-uptake in the anteroseptal region even in the absence of stenosis in the left anterior descending artery. Although some cases of false positives in the inferior region have been reported in patients with right bundle branch block (RBBB), large series have not been described for other intraventricular conduction abnormalities. The objective of this study was to determine the precision of myocardial perfusion SPECT in the diagnosis of coronary heart disease in patients with RBBB and with anterior hemiblock (AHB).

PATIENTS AND METHOD

Patients

From 1994 thru 2002 our center performed a total of 7350 myocardial perfusion SPECT studies on 347 patients with RBBB and 281 with AHB. In 94 of these, RBBB was associated with AHB. We excluded patients with previous myocardial infarction, surgical revascularization, pharmacologic stress testing alone and without coronary angiography, and enrolled 107 patients in the current study: 53 with RBBB and 54 with AHB.
Myocardial Perfusion SPECT

All patients underwent bicycle stress testing limited by symptoms. Twenty patients were simultaneously administered 0.16 µg/kg/min dipyridamole for 4 min as exercise alone was insufficient (maximum heart rate <80% and not reaching 5 MET with absence of symptoms or positive ST segment).

We followed a brief protocol (only 1 day stress/rest) with 99mTc-tetrofosmin. Tomographic images were recorded with an Eslcint SP4 gamma ray camera with high resolution collimator, obtaining short-axis, horizontal long-axis and vertical long-axis views. Images were analyzed by 2 specialists, blinded to clinical and angiographic data, who considered them positive when a slight, moderate or severe defect was identified in at least 2 of the 3 axes or in 3 consecutive tomographic images of the same axis when these were wholly or partially reversible at rest.

Cardiac Catheterization

All patients underwent coronary angiography using Seldinger’s standard technique within 12 months following SPECT (2.9±3.6 months in patients with RBBB and 3.5±3.6 months in those with AHB) assuming no complications had occurred in the interim period. At least 2 projections were obtained to evaluate both left and right main coronary arteries. Two expert observers, blinded to the tomographic results evaluated the severity of the stenosis visually.

Statistical Analysis

We calculated sensitivity, specificity, positive predictive value, negative predictive value and overall value with 95% confidence intervals (CI), and positive (sensitivity/1–specificity) and negative (specificity/1—sensitivity) coefficients of verisimilitude for SPECT. To do so we use coronary angiography results as a gold standard, with 2 different criteria: a) presence of coronary artery disease was defined by ≥50% stenosis in at least one coronary artery, and b) absence of coronary artery disease was defined by a completely normal coronary angiography.

Comparison of categorical variables between groups was by χ² or Fisher’s exact test when the value predicted was <5. Comparison of continuous variables was by Student t test. Values of P<.05 were considered statistically significant.

RESULTS

Demographics, stress test, and catheterization results are described in Table 1. Because previous conventional exercise stress testing had proved inconclusive, 34% of patients were studied for diagnostic purposes. In the remaining 66%, diagnosis of coronary artery disease had been established by coronary angiography and the indication for scintigraphy was for functional evaluation of a coronary lesion the severity of which remained unclear. In 20% of these patients, SPECT was performed during hospitalization 3 days after angina had stabilized.

The diagnostic efficacy of SPECT for the first criterion is shown in Table 2: sensitivity was 90% for RBBB and 92% for AHB; specificity was 58% and 50%, respectively. Of 5 false positives in RBBB patients, only 1 had angiographically normal coronary arteries. All but 1 of the false positives in AHB patients had coronary artery stenosis <50% (Table 3).

The diagnostic efficacy of SPECT for the second criterion is shown in Table 4: we only obtained 1 false positive in RBBB patients and 1 in AHB patients and specificity for diagnosis of coronary heart disease improved to 85.7% and 87.5%, respectively. Using this criterion, both the positive (increased pre-test probability of identifying disease in relation to a test without predictive power) and negative coefficient of verisimilitude (increased pre-test probability of identifying absence of disease in relation to a test without predictive power).
**DISCUSSION**

Intraventricular conduction abnormalities are observed in a considerable percentage of cardiology patients, especially in those referred to nuclear cardiology units, as it may represent a diagnostic problem for conventional exercise testing. In our center, 9.5% of patients present RBBB and/or AHB. The purpose of this study...
has been to determine the diagnostic efficacy of myocardial perfusion SPECT in RBBB and AHB as it has received very little attention in the literature.5,7

We found SPECT sensitivity to be very high, around 90%, both in RBBB and in AHB, but suboptimal (64% and 58%, respectively) when the gold standard adopted for diagnosis of coronary artery disease was the classic criterion of presence of only one coronary artery with stenosis ≥50%. However, when only those patients with healthy coronary arteries were considered strictly normal, specificity was 85.7% in RBBB patients and 87.5% in AHB patients, with a clear improvement in the coefficients of versimilitude.

The possible functional repercussion of ischemia provoked during stress can cause contractile abnormalities and/or regional thickening due to stunning. This is visible in gated-SPECT performed at rest within 30-60 min, but it occurs only when ischemia is severe. In the absence of previous myocardial infarction (all patients in our series), gated-SPECT is useful above all when there is a non-reversible inferior defect. In this case, normal gated-SPECT at rest would support the idea that the defect may be due to diaphragmatic attenuation. In this study, we did not analyze gated-SPECT results as the technique was only used with a small proportion of our patients. However, we insisted on exercise/rest reversibility when considering gamma-graphic results positive.

The anatomic-functional correlation of coronary artery lesions was not always optimal.8,9 This meant that the chosen gold standard to determine the efficacy of the noninvasive test may be highly controversial.10 Curiously, most studies assessing the efficacy of invasive techniques to evaluate the functional significance of angiographically slight or moderate stenoses have used myocardial perfusion SPECT as a gold standard.11-15 Therefore, we should not be surprised that stenosis evaluated visually as <50% could be functionally significant when evaluated by means of pressure guidewires and Doppler or intravascular echocardiography. Thus, bearing in mind that most of the possible false positives detected in our patients correspond to coronary artery stenosis <50% with possibly significant functional repercussions, we believe that the real specificity of SPECT in the presence of RBBB and AHB is very similar to that reported in patients without intraventricular conduction abnormalities.1,2

REFERENCES

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