A New Approach to the Assessment of Tomographic Thallium-201 Scintigraphy in Patients With Left Bundle Branch Block

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To determine whether a new approach to interpretation could improve the accuracy of thallium-201 single photon emission computed tomography (SPECT) for detection of left anterior descending coronary artery disease in patients with left bundle branch block, 69 patients were evaluated. Forty-four had angiographically proved coronary artery disease; the remaining 25 were considered to have a "low" (mean 13.5 ± 6.4%, range 3.4% to 24.9%) likelihood of disease before thallium-201 scintigraphy. The conventional scintigraphic criterion for detection of left anterior descending artery disease (septal, anterior or apical defects) was compared with a new criterion that required the apex to be abnormal to indicate left anterior descending disease.

The normalcy rates in the low likelihood patient group were significantly improved by using the new approach, from 16% to 80% (p < 0.0001) by visual analysis and from 24% to 64% (p = 0.003) by quantitative SPECT polar map analysis. The sensitivity for left anterior descending disease was similar for the conventional and the new method by visual (100% vs. 94%) and quantitative (100% vs. 83%) analyses. In contrast, the specificity was significantly improved by using the new approach, from 14% to 79% (p = 0.0006) by visual analysis and 14% to 64% (p = 0.007) by quantitative analysis.

In conclusion, septal and anterior thallium-201 SPECT defects are common in patients with left bundle branch block without coronary artery disease, resulting in low specificity for left anterior descending artery disease. The normalcy rates and accuracy for detection of left anterior descending coronary artery disease were significantly better when an apical defect was used as the criterion for disease.

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Exercise was stopped and redistribution imaging was begun 3 minutes later. A review of the ECG led to the decision to stop exercise and not proceed with redistribution imaging. The patient had a history of prior myocardial infarction. The chest pain was described as nonanginal and did not occur with exercise. The patient was referred for angiography.

The pretest likelihood of angiographically significant coronary artery disease based on age, gender, risk factors and symptom classification as calculated by the system of Diamond and Forrester using the computer program CADENZA (8-10). Of the 25 patients in this "low likelihood" group, 12 patients had one vessel, 5 had two vessel, and 3 had three vessel disease. The patients underwent catheterization had normal coronary arteriograms. Thus, among the patients who underwent catheterization without prior coronary bypass surgery, 14 patients had no left anterior descending coronary artery disease.

The second group consisted of 12 patients who had previously had a coronary artery bypass operation (11 men and 1 woman, mean age 68 ± 10 years) who underwent catheterization and SPECT thallium-201 testing (performed within 60 days of each other) from 2 months to 13 years postoperatively and who also who had no interval cardiac events or change in symptoms. Of these 12 patients, 6 had stenosis of the left anterior descending, 8 of the left circumflex and 8 of the right coronary artery. Three of the 12 patients had one vessel, 5 had two vessel, and 3 had three vessel disease: 1 patient had a normal arteriogram. In these patients, graft vessels were considered stenotic only when both the native vessel and the graft had significant stenoses.

Group 3 comprised 25 patients (6 men and 19 women, mean age 66 ± 10 years) considered to have a "low to low intermediate" likelihood of angiographically significant coronary artery disease based on age, gender, risk factors and symptom classification as calculated by the system of Diamond and Forrester using the computer program CADENZA (8-11). Of the 25 patients in this "low likelihood" group, 15 were asymptomatic and the remaining 10 had nonanginal chest discomfort (8). The likelihood of coronary artery disease before thallium SPECT imaging was similar in the asymptomatic patients (13.1% ± 2.7%) and those with nonanginal chest pain (13.7% ± 8.3%) (p = NS). The pretest likelihood of angiographically significant coronary artery disease in this group was 13.5% ± 6.4% (range 3.4% to 24.9%).

Exercise protocol. Symptom-limited treadmill exercise was performed by using the standard Bruce protocol with 12 lead ECG monitoring during each minute of exercise and continuous monitoring of leads V1, V5 and aVF. All patients were routinely instructed to discontinue beta-adrenergic blocker or calcium channel blocker medication for 24 to 48 h and long-acting nitrates for 6 h before testing. At near-maximal exercise, 3 to 4 mCi of thallium-201 was injected intravenously, and exercise was continued for an additional minute.

SPECT data acquisition. Early post-stress SPECT imaging in the supine position was begun 10 to 15 min after exercise was stopped and redistribution imaging was begun 3 to 4 h later. SPECT acquisition was performed with use of a rotating large field-of-view gamma camera equipped with 75 photomultiplier tubes, a 0.25 in. (0.64 cm) thick sodium iodide crystal and a low energy, all purpose, parallel hole collimator. Thirty-two projections (40 s/projection) were obtained over a semicircular 180° arc, extending from the 45° right anterior oblique to the left posterior oblique position. A 20% energy window was centered on the 80 keV peak and a second 10% energy window was centered on the 167 keV peak of thallium-201. All projection images were stored on magnetic disk with use of a 64 × 64, 16 bit matrix.

SPECT data processing. Before reconstruction the data were corrected for nonuniformity and center of rotation. The raw data were initially smoothed with a 9 point weighted (4-2-1) average algorithm. Filtered backprojection was then performed with a Butterworth filter with a cutoff frequency of 0.2 Nyquist, order 5, to reconstruct transaxial tomograms encompassing the entire heart. Short-axis and vertical and horizontal long-axis tomograms were extracted from the filtered transaxial tomograms by performing a coordinate transformation with the appropriate interpolation. No attenuation or scatter correction was used. All tomograms were reconstructed at 1 pixel thickness/slice, which represented 6.2 ± 0.2 mm.

Visual and quantitative SPECT interpretation. For visual SPECT images, all short-axis, vertical long-axis and horizontal long-axis tomograms were displayed on transparency film, with the intensity of each image normalized to the maximal pixel value in that image. Tomograms were divided into 20 segments, which were assigned to six evenly spaced regions in representative apical, midventricular and basal cuts of the short-axis views and the anterolateral and inferolateral segments of the mid-vertical long-axis cut (Fig. 1). Segments were visually scored by an expert observer who did not know the angiographic and clinical data with use of a 4 point system (0 = normal, 1 = mild, 2 = moderate and 3 = severe defect). A segment was considered abnormal if the initial poststress score was >2. A reversible defect was defined as an abnormal segment with the respective redistribution thallium score of <2.

The method for the quantification of tomographic thallium studies was similar to that previously described (12,13). The quantitative polar map was separated into three territories corresponding to the anatomic distribution of the three major coronary arteries (12) (Fig. 2). The minimal amount of abnormality (% area) required for a coronary territory to be called abnormal was 12% for the left anterior descending and left circumflex arteries and 8% for the right coronary artery based on previous observations (12). Reversibility was not assessed with quantitative methods. For overall disease detection, studies were considered quantitatively abnormal when one or more vascular territories met the criterion for abnormality.

Assignment of thallium-201 SPECT defects to coronary territories. Conventional approach. Vascular territories were assigned to SPECT imaging by the conventional
method as previously described (14). In brief, for visual analysis, the left anterior descending coronary artery territory in the SPECT images (Fig. 1) was represented by the anterior wall (segments 1, 7 and 13), upper septum (segments 2, 8 and 14), lower septum (segments 3 and 9) and apical segments 19 and 20. The right coronary artery was assigned the inferior wall (segments 4, 10 and 16) and segment 15. The left circumflex artery was assigned the upper lateral (segments 6, 12 and 18) and the lower lateral (segments 5, 11 and 17) walls. This coronary territory assignment was altered for the lower septal and lower lateral walls, depending on the patterns of abnormality in the adjacent segments. If either an inferior or upper septal wall defect, but not both, was present, lower septal abnormalities were assigned to the vessel attributed to the neighboring defect present. Similarly, if either an inferior or an upper lateral wall defect, but not both, was present, lower lateral wall defects were assigned to the vessel attributed to the neighboring defect present. Isolated inferoseptal and inferolateral defects did not occur. For overall detection of disease by visual analysis, more than one segment had to be abnormal for the study to be considered abnormal (15). For quantitative analysis, the interpretative scheme previously described (12) was used.

**New approach.** Using the new approach, which constitutes the basis of this report by visual analysis, left anterior descending coronary artery disease was considered present only when the apex of the left ventricle (segment 19 or 20) was abnormal. By quantitative analysis, left anterior descending coronary artery disease was considered present only when the stress polar map contained a perfusion defect >12% and the stress defect involved >50% of the apex (Fig. 2).

**Coronary angiography.** Coronary angiography was performed with the standard Judkins approach within 60 days of SPECT thallium-201 scintigraphy in the 44 patients who underwent catheterization. All coronary angiograms were interpreted by two experienced observers who were unaware of the stress-redistribution thallium scintigraphic results. A significant coronary stenosis was defined as >50% luminal diameter narrowing. All coronary angiograms were also reviewed with respect to the anatomic supply of the left ventricular apex by the left anterior descending artery.

**Statistical analysis.** The normalcy rate was defined as the number of patients from the low likelihood group with a normal scintigraphic pattern divided by the total number of patients in the low likelihood group. The term “normalcy rate” is used to distinguish this group from the group conventionally used for specificity on the basis of normal coronary arteriographic results. We previously (13) described the need for this group in a time when a powerful posttest referral bias is operative, with preferential selection of positive test responders for angiography. All continuous measures were summarized as the mean values ± SD. The mean differences for continuous variables were compared with the Student’s paired t test. McNemar’s test was used to assess the significance of the differences between sensitivities, specificities and normalcy rates. A p value <0.05 was considered significant. Comparisons of proportions were made with the chi-square statistic or, when appropriate, with Fisher’s exact test.

**Results**

Normalcy rates (Fig. 3). The normalcy rates for the overall study in the 25 patients with a low likelihood of
coronary artery disease (Group 1) were significantly improved by using the new approach for assessment of the abnormality in the left anterior descending territory. For visual analysis, the normalcy rate with the conventional approach was 16% (4 of 25) compared with 80% (20 of 25) ($p < 0.0001$) by the new approach. For quantitative analysis, the normalcy rate with the conventional approach was 24% (6 of 25) compared with 64% (16 of 25) by the new approach ($p = 0.003$).

Sensitivity and specificity for left anterior descending artery disease (Fig. 4 and 5). When the conventional and the new approach for assessing the left anterior descending artery territory were compared, the sensitivity for left anterior descending artery disease was similar using either approach (Group 1): 100% (18 of 18) versus 94% (17 of 18) by visual analysis ($p = 0.3$) and 100% (18 of 18) versus 83% (15 of 18) ($p = 0.07$) by quantitative analysis (Fig. 4). In contrast, the specificity for left anterior descending artery disease was significantly better with the new approach: 14% (2 of 14) versus 79% (11 of 14) by visual analysis ($p = 0.0006$) and 14% (2 of 14) versus 64% (9 of 14) by quantitative analysis ($p = 0.007$) (Fig. 5).

Of the 15 Group 1 patients with multivessel disease, 14 had involvement of the left anterior descending artery. Thirteen of the 14 had an apical defect, and in all but 1 patient the left anterior descending artery was noted to supply the left ventricular apex. Of the six Group 1 patients with one vessel disease, four had left anterior descending artery disease. All four had an apical defect and in all but one patient the left anterior descending artery was shown to supply the left ventricular apex.

Of the other 11 Group 1 patients without coronary artery disease and 3 patients with no left anterior descending artery disease but coexisting disease of the right coronary artery or left circumflex artery, 11 had an apical defect by angiography and 10 had the left anterior descending artery supplying the left ventricular apex (the 11th patient had dual supply from both the left anterior descending and posterior descending arteries).
Table 1. Frequency by Segmental Location of Visual and Quantitative Stress Perfusion Defects and Visual Reversible Defects in the Left Anterior Descending Artery Territory in 39 Patients With Left Bundle Branch Block Without Evidence of Left Anterior Descending Artery Disease*

<table>
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<tr>
<th></th>
<th>Septal</th>
<th>Anterior</th>
<th>Septal and/or Anterior</th>
<th>Apical</th>
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<tr>
<td><strong>Visual</strong></td>
<td></td>
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<tr>
<td>Stress perfusion</td>
<td>29/39 (74%)</td>
<td>13/39 (33%)</td>
<td>33/39 (85%)</td>
<td>5/39 (13%)</td>
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<td>defects (patients)</td>
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<tr>
<td>Total stress</td>
<td>104</td>
<td>35</td>
<td>139</td>
<td>14</td>
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<tr>
<td>defects (segments)</td>
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<tr>
<td>Reversible</td>
<td>83/104 (80%)</td>
<td>27/35 (77%)</td>
<td>110/139 (79%)</td>
<td>11/14 (79%)</td>
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<tr>
<td>defects (segments)</td>
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<td><strong>Quantitative</strong></td>
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<tr>
<td>Stress defects</td>
<td>27/39 (69%)</td>
<td>17/39 (43%)</td>
<td>44/78 (56%)</td>
<td>14/39 (36%)</td>
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<td>(patients)</td>
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*The group included 25 patients with low likelihood of coronary artery disease and 14 with a normal left anterior descending artery by angiography.

In the subgroup of 12 patients who had coronary artery bypass surgery (Group 2), the comparison between the conventional and the new approach for assessing the left anterior descending artery territory revealed a sensitivity of 100% (6 of 6) versus 83% (5 of 6) (p = NS) by both visual and quantitative analyses. Again, the specificity for left anterior descending artery disease in these 12 patients was apparently improved with the new approach: 17% (1 of 6) versus 83% (5 of 6) by visual analysis (p = 0.04) and 33% (2 of 6) versus 67% (4 of 6) by quantitative analysis (p = NS).

Sensitivity and specificity in the left circumflex and right coronary artery territories (Fig. 6 and 7). Sensitivity and specificity values of thallium-201 SPECT for identification of disease in the other coronary vessels were based on only conventional criteria for abnormality. Sensitivity for visual and quantitative analyses (Fig. 6) ranged from 76% for quantitative sensitivity in the right coronary artery territory to 91% for visual sensitivity in the left circumflex zone.

Specificity for visual and quantitative analyses (Fig. 7) ranged from 60% for quantitative specificity in the right coronary artery territory to 95% for visual specificity in the left circumflex region.

In the 12 Group 2 patients, the sensitivity was 100% by both visual and quantitative analyses in the right coronary and left circumflex territories. The specificity for both visual and quantitative analyses was 75% in the right coronary artery territory and that in the left circumflex region was 75% for quantitative and 100% for visual analysis.

Frequency of stress defects and defect reversibility in patients without evidence of left anterior descending artery disease. The frequency of septal, anterior and apical stress perfusion defects in the 25 patients with a low likelihood of coronary artery disease and the 14 patients with no left anterior descending artery disease by angiography for visual and quantitative analysis is shown in Table 1. A reversible septal or anterior defect or both was present in 33 (86%) of

Figure 6. Sensitivity for detection of right coronary artery (RCA) and left circumflex coronary artery (LCX) disease with visual (dotted bars) and quantitative (striped bars) techniques.

Figure 7. Specificity for detection of right coronary artery (RCA) and left circumflex coronary artery (LCX) disease. Conventions as in Figure 6.
the 39 patients. Of the 139 segments with a stress defect, 110 (79%) were reversible.

**Case examples.** Figure 8 is a case example of a patient with left bundle branch block from our study group with a low likelihood of disease. The patient was a 77 year old woman who had an 8% likelihood of angiographically significant coronary artery disease before SPECT imaging. SPECT images demonstrated a reversible septal defect. Note that the left ventricular apex appeared to have normal myocardial perfusion. Figure 9 is a case example of a patient with angiographically proved coronary artery disease. The patient was a 77 year old asymptomatic man with new left bundle branch block on routine ECG. He had no history of myocardial infarction. Reversible defects were present in the left anterior descending coronary artery distribution involving the left ventricular apex. There was also a partially reversible defect in the inferior wall, which is attributed to the right coronary artery distribution. On coronary angiography, the patient was shown to have a 90% stenosis of the left anterior descending coronary artery as well as a complete
occlusion of the right coronary artery. In this patient the left anterior descending artery was shown to supply the left ventricular apex.

Discussion

Noninvasive diagnosis of coronary artery disease in patients with left bundle branch block. The clinical significance of left bundle branch block is not always clear (1). The cause may vary, and prognosis seems to correlate best with the nature of the underlying cardiac disease (16). Because the incidence of coronary artery disease in the presence of left bundle branch block is >40% (17) and symptoms may be atypical or absent, accurate noninvasive diagnostic tests could have important clinical implications in the management of patients with left bundle branch block and no prior known coronary artery disease. However, noninvasive tests, including stress ECG (1) and ventriculographic wall motion studies (18–20), are limited by the presence of frequent nondiagnostic and false positive findings. With respect to perfusion imaging, reversible septal myocardial perfusion defects, with or without anterior perfusion defects, have been described frequently in patients without coronary artery disease by stress-redistribution thallium-201 scintigraphy using both the planar and SPECT methods (4–7). The specificity for left anterior descending artery disease by conventional thallium-201 analysis is low, ranging from 10% to 27% (6,7).

Sensitivity and specificity for left anterior descending coronary artery disease. Our study using thallium-201 SPECT confirms the low specificity of conventional criteria for left anterior descending artery disease: 14% by both visual and quantitative analysis. Use of an apical defect as the new criterion for left anterior descending artery disease resulted in significant improvement in the specificity for such disease by both visual and quantitative analysis: to 79% by visual and to 64% by quantitative analysis. Furthermore, the new criterion did not significantly alter the visual sensitivity for left anterior descending artery disease. This new criterion resulted in specificities for left anterior descending artery disease that are similar to those reported in patients without left bundle branch block, in whom specificity for disease of this artery by thallium-201 SPECT is between 89% and 91% by visual analysis (13,21) and between 63% to 91% by quantitative analysis (13,22,23).

Normalcy rate for overall detection of coronary artery disease. Because of a posttest referral bias (by which the positive test responders are preferentially subject to catheterization), the patients with normal coronary arteries or insignificant coronary artery stenoses who underwent catheterization constitute an inadequate standard for the estimation of true radionuclide stress test specificity. As an alternative, our group (13,24) previously suggested that patients with a low pretest likelihood of coronary artery disease are more suitable for assessment by myocardial scintigraphic test specificity. We have used the term "normalcy rate" to describe the results for this group to distinguish this assessment from conventional specificity derived in patients with normal coronary arteriographic results. In contrast to young, healthy normal volunteers, patients with a low pretest likelihood of coronary artery disease represent a subgroup of the general test population referred clinically that is closer in age and symptoms to the coronary artery disease population. For this study, patients with left bundle branch block who were asymptomatic or had nonanginal chest discomfort were considered to have a low likelihood of coronary artery disease. Because the exercise ECG was nondiagnostic in the patients with left bundle branch block, the likelihood of disease in this group was higher than that in our previous low likelihood patient groups (12–14), in whom a negative exercise ECG allowed for a <5% pretest likelihood of coronary artery disease for inclusion. The likelihood of coronary artery disease in the present “low-likelihood group” was 13.5 ± 6.4%, with no significant difference in likelihood of disease in patients who were asymptomatic or did not have anginal chest pain. This lack of difference is explained by more prevalent risk factors and older age in the asymptomatic group. Of the five apical defects noted in the low likelihood group (by visual analysis), four were present in the patients who were asymptomatic.

With the conventional criteria for abnormality our results demonstrated a normalcy rate of 16% and 24% by visual and quantitative analysis, respectively. The new criterion for left anterior descending coronary territory abnormality improved the rate to 80% by visual and to 64% by quantitative analysis. In patients without left bundle branch block the normalcy rate of quantitative thallium-201 SPECT has been shown to be 82% (13). Because the likelihood of coronary artery disease was 13.5% in these patients, some of the 25 patients may have actually had significant coronary artery disease even though they were believed to have a low likelihood of disease. If any of the patients had an apical defect their inclusion in the low likelihood group would have falsely lowered the normalcy rate. Thus, the visual and quantitative normalcy rate of 80% and 64%, respectively, may in fact underestimate the true specificity of thallium-201 SPECT with the new criterion.

Sensitivity and specificity for detection of disease in the left circumflex and right coronary arteries. With respect to detection of disease in vascular territories other than the left anterior descending coronary artery, our results demonstrate sensitivity and specificity rates similar to those in patients without left bundle branch block (13,21,23) (Fig. 6 and 7). The lower specificity for the right coronary as opposed to the left circumflex coronary territory was observed with supine SPECT thallium-201 studies in patients without left bundle branch block and is attributed to diaphragmatic attenuation that predominately affects this area. DePuey et al. (7) reported similar results of preserved high sensitivity and specificity for detection of left circumflex and right coronary artery disease with thallium-201 SPECT in patients with left bundle branch block.

Among patients with prior coronary artery bypass sur-
surgery, the conventional approach and the new interpretation criterion resulted in similar sensitivities for left anterior descending disease, and these results were also similar to those in patients who underwent catheterization (Group 1) with no prior intervention. The specificity for left anterior descending artery disease with use of the new criterion was also similar to that in Group 1, but the changes from the specificities obtained with the conventional method were statistically less significant. This latter finding is probably related to the small size of the bypass surgery group (Group 2).

Frequency of stress defect reversibility. Our study showed that 79% (110 of 139) of the septal or anterior stress defects that were present in patients with a low likelihood of coronary artery disease and those with an angiographically normal left anterior descending artery were reversible. The high frequency of reversible defects is consistent with the proposed mechanisms of perfusion abnormalities in left bundle branch block (5,6,25) and is concordant with that observed by Huerta et al. (6), who reported a frequency of 73% using planar thallium-201 stress-redistribution studies in a smaller group of 11 patients.

Proposed mechanism of stress perfusion defects in patients with left bundle branch block and no coronary artery disease. In left bundle branch block, the temporal delay between left and right ventricular systole results in a prolonged systolic time interval for the intraventricular septum without such prolongation in the remaining left ventricular walls. Because most coronary flow occurs in diastole, this would have the effect of reducing septal myocardial perfusion as a result of a reduction in diastolic filling time. This effect would be expected to be accentuated during exercise since increased heart rates disproportionately reduce diastolic filling time in comparison with systolic time. With respect to thallium-201, one would expect perfusion defects resulting from these dynamics to be reversible because the equilibrium distribution of thallium-201 would be proportional to the size of the potassium pool, unaffected by the dynamics of blood flow. The occasional nonreversible perfusion defect observed in patients with left bundle branch block in the absence of coronary artery disease might be explained by septal fibrosis, sometimes observed in these patients (25). Experiments in dogs without coronary occlusion have demonstrated (3) that during rapid right ventricular pacing (which electrically simulates left bundle branch block), regional myocardial blood flow assessed by microspheres and thallium-201 uptake in the myocardial septum was less than that in the lateral wall of the left ventricle. Furthermore, Nozawa et al. (26), using rapid right ventricular pacing in patients with normal coronary arteriograms, found that reversible septal thallium-201 defects developed in all of them.

Our new analytic approach was based on this mechanism with the further hypotheses that myocardial perfusion and functional abnormalities related to left bundle branch block should not involve the left ventricular apex because this region would not be subject to the reduced diastolic filling time that affects the septum. On the other hand, most perfusion abnormalities related to stenotic lesions of the left anterior descending coronary artery would be expected to involve the apex because this region is the most distal territory supplied by this artery and it is usually supplied by this artery (27). By definition, the new approach could result in false negative studies in patients with isolated stenosis of the septal perforator branches of the left anterior descending coronary artery. However, septal perforator stenosis in the absence of stenosis of this artery is uncommon (28).

Relation to exercise heart rate. In light of the proposed mechanisms for presence of perfusion defects in left bundle branch block discussed in the previous section, the occurrence of thallium-201 reversible defects would be expected to be heart rate-dependent. In our study, among patients with no left anterior descending artery disease, seven (78%) of the nine who achieved a peak heart rate >165 beats/min had a reversible septal defect with or without an anterior or apical reversible defect, whereas neither of the two patients who achieved a heart rate <120 beats/min had a reversible defect. DePuey et al. (7) also found that the absence of reversible septal defects in left bundle branch block appeared to be associated with lower exercise heart rates. In addition, Burns et al. (29) recently studied six patients with left bundle branch block and without left anterior descending artery disease. All underwent exercise-redistribution and dipyridamole thallium-201 SPECT imaging. The specificity of dipyridamole thallium-201 imaging was significantly higher than that of exercise studies for left anterior descending artery disease (100% vs. 33%). This finding may be explained by the proposed prolonged septal contraction mechanism, because the peak heart rate associated with dipyridamole stress was significantly lower than that associated with exercise. The role of dipyridamole or adenosine thallium-201 scintigraphy in left bundle branch block deserves further evaluation.

Conclusions. This new approach for analyzing stress-redistribution thallium-201 SPECT by both visual and quantitative analyses, which defines left anterior descending artery disease as the presence of an apical defect in patients with left bundle branch block, significantly improved specificity for left anterior descending artery disease while preserving sensitivity for disease in this and the other coronary vessels. The approach improved the normalcy rate in patients with a low likelihood of coronary artery disease. Conventional interpretative criteria with thallium-201 SPECT were confirmed to be accurate for detection of disease in the other coronary vessels. A prospective study is needed to confirm the accuracy of this new method in the diagnosis of left anterior descending artery disease by thallium-201 SPECT imaging in patients with left bundle branch block.

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References


