Underestimation of Extent and Severity of Coronary Artery Disease by Dipyridamole Stress Thallium-201 Single-Photon Emission Computed Tomographic Myocardial Perfusion Imaging in Patients Taking Antianginal Drugs

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Objectives. This study evaluated the diagnostic value of dipyridamole plus low level treadmill exercise (dipyridamole stress) thallium-201 single-photon emission computed tomography (SPECT) in patients taking antianginal drugs.

Background. Dipyridamole stress is the major substitute for maximal exercise in patients referred for myocardial perfusion imaging. Although antianginal drugs are commonly suspended before exercise, dipyridamole stress is usually performed without discontinuing these drugs.

Methods. Twenty-six patients underwent two dipyridamole perfusion studies: the first without (SPECT-1) and the second with (SPECT-2) antianginal treatment. Twenty-one patients (81%) received calcium antagonists, 19 (73%) received nitrates, and 8 (31%) received beta-blockers. Eighteen of the patients underwent coronary angiography. Data are presented as the mean value ± SD.

Results. Visual scoring yielded significantly larger and more severe reversible perfusion defects for SPECT-1 than for SPECT-2. Quantitative analysis showed larger perfusion defects on stress images of SPECT-1 in the left anterior descending coronary artery (LAD) (25 ± 21% vs. 17 ± 15%, p = 0.003), left circumflex coronary artery (LCx) (56 ± 35% vs. 48 ± 36%, p = 0.03) and right coronary artery (RCA) (36 ± 27% vs. 25 ± 24%, p = 0.008) territories. Individual vessel sensitivities in the LAD, LCx and RCA territories were 93%, 79% and 100% for SPECT-1 and 64%, 50% and 70% for SPECT-2, respectively. These differences were highly significant for the LAD (p = 0.004) and LCx (p = 0.00004) territories. The overall individual vessel sensitivity of SPECT-1 was significantly higher than that of SPECT-2 (92% vs. 62%, p = 0.00003). Specificity was not significantly different in SPECT-1 compared with SPECT-2 (80% and 93%, p = 0.33).

Conclusions. Continued use of antianginal drugs before dipyridamole plus low level treadmill exercise thallium-201 SPECT may reduce the extent and severity of myocardial perfusion defects, resulting in underestimation of coronary artery disease.

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Pharmacologic vasodilation with dipyridamole in conjunction with low level treadmill exercise (dipyridamole stress) is a substitute for maximal exercise in patients undergoing myocardial perfusion imaging who are unable to exercise adequately (1). Antianginal medications are usually discontinued before exercise myocardial perfusion imaging because they may reduce the sensitivity and negative predictive value of the test (2–6). Standard protocols for dipyridamole stress perfusion imaging, however, do not require discontinuation of antianginal drugs. Furthermore, reluctance to discontinue these drugs, especially in patients with significant angina or hypertension, is a frequent reason for performing a pharmacologic stress test. Intravenous dipyridamole induces maximal vasodilation and increases regional heterogeneity in myocardial perfusion in the presence of coronary artery disease (CAD), as detected by myocardial perfusion imaging (7–13). Antianginal drugs may interfere with this mechanism and reduce the accuracy of the test.

The goal of the present study was to assess the effect of antianginal drugs on the diagnostic yield of thallium-201 single-photon emission computed tomographic (SPECT) imaging in patients with CAD after dipyridamole combined with low level treadmill exercise. This was achieved by comparing the results of two separate dipyridamole stress tests, each performed according to standard protocol and carried out in the same group of patients. The only difference between the two studies was that patients stopped taking their antianginal...
drugs before the first test but did not discontinue these drugs before the second test.

Methods

Patient group and study design. Twelve hundred patients underwent dipyridamole stress thallium-201 SPECT in our laboratory between June 1995 and January 1997. According to our routine protocol, patients were not asked to discontinue antianginal medications before the test. Twenty-six patients with one or more reversible perfusion defects, who on their own initiative discontinued antianginal treatment before the dipyridamole SPECT study (SPECT-1), formed the present study group. Only patients who were not taking beta-blockers for at least 48 h, nitrates for at least 24 h and calcium antagonists for at least 48 h before the study were included. These patients were asked to return for a repeat dipyridamole stress SPECT study (SPECT-2), without discontinuing their antianginal treatment. The mean time interval between SPECT-1 and SPECT-2 was 11 ± 6 days (range 6 to 24). Patients were excluded if they had complete left bundle branch block, a permanent pacemaker or suspected left main CAD.

Dipyridamole stress and imaging protocols. The stress and imaging protocols of the test were identical for SPECT-1 and SPECT-2. Caffeinated beverages were not allowed for 24 h before both dipyridamole studies. A dose of 0.56 mg/kg body weight of dipyridamole was infused over a 4-min period, followed by a submaximal treadmill exercise. Four minutes after completion of dipyridamole infusion, a bolus of 2.5 to 3 mCi of thallium-201 was injected intravenously and exercise was continued for 1 min. Continuous electrocardiographic (ECG) monitoring was carried out, and blood pressure was measured and a 12-lead ECG obtained at baseline and every 2 min throughout the test. The clinical response was considered positive if the patient’s angina was reproduced. Horizontal or downsloping ST segment depression ≥1 mm or upsloping ST segment depression ≥1.5 mm at 0.08 s after the J point was considered as an ischemic ECG response. A dose of 100 mg of aminophylline was administered intravenously in the event of chest pain or other symptoms, or after significant ST segment depression. SPECT acquisition was started ~8 min after thallium-201 injection. Imaging was performed with either a single-detector (SP4, Elscint Ltd., Israel) or right-angled dual-detector camera (CardiaL, Elscint Ltd., Israel), with a high resolution, parallel-hole collimator. The same camera was used for each patient in the SPECT-1 and SPECT-2 studies. A 20% window centered on the 70-keV photopeaks and a 10% window centered on the 167-keV photopeaks were used. Thirty projections of 40 s each were obtained over a 180° arc in a circular orbit (from the 45° right anterior oblique to the 45° left posterior oblique projection). After termination of SPECT imaging, reinjection of 1 mCi of thallium-201 was administered. Redistribution images were obtained 3.5 to 4 h after dipyridamole infusion. After acquisition, all studies were subjected to quality control (14), including cine display of the raw data, which enabled the detection of cardiac motion and its correction if necessary.

Coronary angiography. Eighteen of the 26 patients were referred for coronary angiography by the attending physician according to clinical indications. The mean time interval between the SPECT-1 study and coronary angiography was 39 ± 53 days (range −3 to 161). There were no intervening coronary events or therapeutic interventions during this period.

Coronary angiograms were obtained in multiple projections and evaluated by an independent, experienced angiographer. The degree of stenosis of the coronary arteries was visually estimated as a percentage of the normal segment preceding the stenosis. Significant coronary stenosis was defined as >50% narrowing of the lumen diameter in a coronary artery or one of its major branches. Three of the 18 patients had undergone coronary artery bypass graft surgery in the past. In these patients significant coronary stenosis was defined as >50% narrowing of the lumen diameter of a native coronary artery, combined with significant narrowing (>50%) of the graft connected to that artery. All patients had significant narrowing of at least one coronary artery. The number of patients with single-, double- and triple-vessel disease was 4 (22.2%), 8 (44.4%) and 6 (33.3%), respectively.

Data analysis. Visual analysis. The 52 SPECT studies were visually assessed at random by an experienced nuclear cardiologist who had no knowledge of the clinical and angiographic data. The 20-segment model of the left ventricle was used; three representative short-axis slices from the apical, mid and basal portions of the left ventricle were each divided into six segments, and the apical portion of one representative vertical long-axis slice was divided into two segments, as previously described (15). Each segment was scored using a 5-point scoring system: 0 = normal; 1 = mildly reduced; 2 = moderately reduced; 3 = severely reduced; and 4 = absence of thallium-201 uptake. A total of 520 segments were analyzed.

The following indexes were calculated for each SPECT study: 1) summed stress score (SSS) = the sum of stress scores of all 20 segments; 2) summed redistribution score (SRS) = the sum of the differences between stress and rest score of each segment (differences <2 were not included); 3) percentage of segments with a score >1 (extent of perfusion defects); and 4)
percentages of segments with a score >2 (severity of perfusion defects).

**Quantitative analysis.** The location and size of perfusion defects at stress and redistribution were quantitatively assessed using a polar map display of a commercially available software program previously described (16,17). Defects were assigned to one of the three coronary artery territories, and expressed as a percentage of that territory.

**Statistical analysis.** All data are expressed as the mean value ± SD. A comparison between SPECT-1 and SPECT-2 variables was performed using the two-tailed paired t test. Distribution of segments according to visual score was compared by using the kappa statistic with 95% confidence interval (CI). In addition, the differences between quantitative stress scores of SPECT-1 and SPECT-2 were analyzed by multiple analysis of variance with repeated measures using the patient as the unit of analysis and the percent score in each coronary artery territory as the outcome variable, with Bonferroni correction for multiple comparisons. These calculations were performed using SPSS version 6.1 for Windows. Sensitivity and specificity for detection of CAD were calculated for individual vascular territories: sensitivity (%) = true positive/(true positive + false negative) × 100; specificity (%) = true negative/(true negative + false positive) × 100. Sensitivities and specificities were compared by using the chi-square test. A p value <0.05 was considered significant.

### Results

**Baseline clinical characteristics.** The mean age of the 26 patients included in the study was 64 ± 10 years (range 47 to 85); 24 (92%) were men and 2 (8%) were women. Twelve (46%) had a previous myocardial infarction, 7 (27%) had remote percutaneous coronary angiography and 6 (23%) had coronary artery bypass graft surgery. Twenty-one patients (81%) were treated with calcium channel blockers, 19 (73%) with nitrates and only 8 (31%) with a beta-blocker. Twenty patients (77%) received a combination of more than one drug. Nitrates and calcium antagonists were the most frequent combination (n = 13). Seven of the eight patients taking beta-blockers also received an oral nitrate, calcium antagonist or both.

**Clinical response and ECG and hemodynamic changes during stress test.** An ischemic clinical response was present in 16 patients (62%) during the SPECT-1 study and in 10 patients (38%) during SPECT-2 (p = NS). Thus, 6 (37%) of 16 patients with a positive clinical response during SPECT-1 reverted to a negative response at SPECT-2. The SSS in these six patients was 30 ± 7 during SPECT-1 and 18 ± 9 during SPECT-2 (p = 0.04). This difference was larger than that for the whole study group (24 ± 10 vs. 19 ± 11). No patient with anginal pain during the SPECT-2 study was asymptomatic during SPECT-1. An ischemic ECG response was observed in nine patients (35%) in both SPECT studies. Thus, the reduction in severity of perfusion defects in SPECT-2 was accom-

### Table 1. Segment Distribution According to Visual Score of Stress Images During Single-Photon Emission Computed Tomography With and Without Antianginal Therapy

<table>
<thead>
<tr>
<th>Score for SPECT-2</th>
<th>Score for SPECT-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>204</td>
</tr>
<tr>
<td>1</td>
<td>32</td>
</tr>
<tr>
<td>2</td>
<td>28</td>
</tr>
<tr>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

Exact agreement 57% (294 of 520 segments); kappa 0.36. Numbers in boldface indicate exact agreement between SPECT-1 and SPECT-2. SPECT-1 and SPECT-2 = dipyridamole stress thallium-201 single-photon emission computed tomographic study with and without antianginal drugs, respectively.

**Baseline heart rate** was similar during the SPECT-1 and SPECT-2 studies (78 ± 15 vs. 72 ± 17 beats/min, p = 0.11). Baseline systolic and diastolic blood pressures were significantly lower during SPECT-2 than during SPECT-1 (132 ± 19 vs. 145 ± 22 mm Hg, p = 0.003 and 77 ± 10 vs. 83 ± 12 mm Hg, p = 0.005, respectively). Changes in heart rate, systolic blood pressure and rate-pressure product during dipyridamole plus submaximal exercise were similar in both studies (45 ± 19% vs. 43 ± 24%, -2 ± 13% vs. 3 ± 21% and 43 ± 32% vs. 50 ± 47%, respectively; p = NS).

**SPECT imaging.** **Visual analysis.** Table 1 shows the results of visual analysis of stress images. The number of segments is displayed according to the visual score during SPECT-1 and SPECT-2. Of the 520 segments analyzed, only 294 (57%) showed exact score agreement. The kappa value was 0.36 (95% CI 0.30 to 0.42). A higher score was present in 158 segments (30%) during SPECT-1 as compared with only 68 segments (13%) during SPECT-2 (p < 0.0001).

The mean SSS and mean SRS were both significantly higher during the SPECT-1 study than during SPECT-2 (24 ± 10 vs. 19 ± 11, p = 0.01 and 15 ± 8 vs. 11 ± 9, p = 0.04 respectively (Table 2). The proportion of segments with a score >1 and a score >2, representing the extent and severity of perfusion defects, respectively, were both larger during SPECT-1 than during SPECT-2 (38% vs. 30% and 22% vs. 13%, p < 0.01).

### Table 2. Results of Visual Analysis Indexes

<table>
<thead>
<tr>
<th>Score</th>
<th>SPECT-1</th>
<th>SPECT-2</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSS</td>
<td>24 ± 10</td>
<td>19 ± 11</td>
<td>0.01</td>
</tr>
<tr>
<td>SRS</td>
<td>15 ± 8</td>
<td>11 ± 9</td>
<td>0.04</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Score</th>
<th>SPECT-1</th>
<th>SPECT-2</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;1 (extent)</td>
<td>198 (38%)</td>
<td>157 (30%)</td>
<td>0.007</td>
</tr>
<tr>
<td>&gt;2 (severity)</td>
<td>116 (22%)</td>
<td>68 (13%)</td>
<td>0.00009</td>
</tr>
</tbody>
</table>

Data are presented as mean value ± SD or number (%) of segments. SRS = summed redistribution score; SSS = summed stress score; other abbreviations as in Table 1.
Quantitative analysis. Table 3 shows the defect size at stress and rest according to the coronary artery territory. The mean overall stress score for SPECT-2 was significantly lower than that for SPECT-1, by 11.1% (95% CI 5.7 to 16.5%) (p < 0.0003). The mean size of perfusion defects at stress was significantly larger for SPECT-1 than for SPECT-2 in the left anterior descending coronary artery (LAD) (25 ± 21% vs. 17 ± 15%, p = 0.003), left circumflex coronary artery (LCx) (56 ± 35% vs. 48 ± 36%, p = 0.03) and right coronary artery (RCA) (36 ± 27% vs. 25 ± 24%, p = 0.008) territories. The differences in scores for the LAD and RCA territories remained statistically significant (p = 0.01 and p = 0.02, respectively) after the Bonferroni correction for multiple comparisons. For the LCx territory, the p value was 0.07.

The defect size was larger during SPECT-1 in 20 patients (77%) in the LAD, 16 patients (62%) in the LCx and 17 patients (65%) in the RCA territories (Fig. 1). There were no significant differences in the defect size at rest.

Detection of coronary stenosis in individual vessel territory. Coronary angiography demonstrated that 14 patients had LAD stenosis, 14 patients had LCx stenosis and 11 patients had RCA stenosis. Based on visual scoring with the assignment of segments to individual coronary artery territories, SPECT-1 showed ischemia in the LAD territory in 13 patients, in the LCx territory in 11 and in the RCA territory in 11. SPECT-2 showed ischemia in the LAD in 9 patients, in the LCx in 7 patients and in the RCA territory in 8 patients. Thus, of the 18 patients who underwent coronary angiography, the sensitivities for detecting CAD in the LAD, LCx and RCA territories were 93%, 79% and 100%, respectively, for SPECT-1 as compared with 64%, 50% and 70% for SPECT-2 (Fig. 2). These differences were statistically significant in the LAD (p = 0.004) and LCx (p = 0.0004) regions, although the difference in the RCA territory was not significant (p = 0.15). Sensitivity to detect CAD in any of the coronary vascular territories was significantly higher in SPECT-1 as compared with SPECT-2 (92% vs. 62%, p = 0.00003). Overall individual vessel specificity of SPECT-1 and SPECT-2 was not significantly different (80% and 93%, p = 0.33).

Of the 18 patients who underwent coronary angiography, underestimation of the number of coronary territories involved was observed in 3 patients (17%) in SPECT-1 as compared with 10 patients (56%) in SPECT-2 (p = 0.03). The three patients with underestimation of the number of stenosed vessels in SPECT-1 had angiographic three-vessel disease, which was underestimated as two-vessel disease, but still showed a significant amount of ischemia. Of the 10 patients with underestimation of the number of stenosed vessels in SPECT-2, 8 (44%) had multivessel disease. These patients had a significant amount of ischemia in SPECT-1 as compared with a small amount of ischemia in SPECT-2, which would have led to deferring angiography.

The case example in Figure 3 shows underestimation of both the number of coronary arteries involved and the severity of CAD in a patient with multivessel disease (moderate mid-LAD stenosis and total occlusion of the proximal RCA and mid-LCx, with collateral flow to both arteries from the LAD), as demonstrated by angiography.

Table 3. Quantitative Analysis: Mean Defect Size (percent coronary artery territory at stress and rest imaging)

<table>
<thead>
<tr>
<th></th>
<th>LAD</th>
<th>LCx</th>
<th>RCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECT-1</td>
<td>SPECT-2</td>
<td>p Value</td>
<td>SPECT-1</td>
</tr>
<tr>
<td>Stress</td>
<td>25 ± 21%</td>
<td>17 ± 15%</td>
<td>0.003</td>
</tr>
<tr>
<td>Rest</td>
<td>13 ± 11%</td>
<td>11 ± 10%</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Data are presented as mean value ± SD. LAD = left anterior descending coronary artery; LCx = left circumflex coronary artery; RCA = right coronary artery; other abbreviations as in Table 1.

Figure 1. Quantitative stress defect size in the three coronary artery territories for individual patients without (SPECT-1) and with (SPECT-2) antianginal drugs.

Figure 2. Sensitivities for the detection of single-vessel CAD without (SPECT-1) and with (SPECT-2) antianginal drugs. Solid bars = SPECT-2; open bars = SPECT-1.
Discussion

This study evaluated the effect of antianginal drugs on myocardial perfusion imaging after pharmacologic vasodilation with dipyridamole in patients with CAD. The results show that antianginal drugs reduce the extent and severity of thallium-201 tomographic perfusion defects. Discontinuation of antianginal drugs before the test resulted in improved sensitivity for CAD detection in the individual vascular territories.

Effect of antianginal drugs on perfusion defects. Visual and quantitative analyses of SPECT images showed concordant results regarding the extent of perfusion defects at stress. Discontinuation of antianginal drugs resulted in significantly larger perfusion defects in all coronary artery territories. The severity of perfusion defects at stress was also increased, as confirmed by visual analysis. These differences in myocardial perfusion at stress can be attributed to reversible defects, because analysis of redistribution images yielded no difference in the defect size at rest, and to higher reversibility scores when antianginal drugs were discontinued.

Effect of antianginal drugs on individual vessel sensitivity. Several investigators have evaluated the sensitivity of myocardial perfusion imaging during pharmacologic vasodilation with dipyridamole or adenosine for detection of individual CAD (18–20). In these studies patients were not instructed to discontinue antianginal drugs; therefore, variable proportions of patients were taking these drugs at the time of the test. Although overall sensitivity to detect CAD ranged from 87% to 92%, individual vessel sensitivities were lower, in the range of 50% to 80%. Our results show higher overall individual vessel sensitivity for SPECT-1 as compared with SPECT-2 (92% vs. 62%, p = 0.000003). Compared with previous reports, sensitivities for SPECT-1 are higher, whereas sensitivities for SPECT-2 are in the lower range of reported values. Recently, Sundereswaran et al. (21) demonstrated that antianginal drugs reduce the sensitivity of adenosine SPECT myocardial perfusion imaging for detection of CAD. They compared test sensitivity in two separate patient groups—one group taking and the other not taking antianginal drugs. In the present study we compared the results of dipyridamole SPECT myocardial perfusion imaging performed with and without drug administration in the same patient. Our results are concordant with the results reported by Sundereswaran et al.

Effect of antianginal drugs on clinical and ECG responses. There was no difference in the prevalence of either the ECG ischemic response between SPECT-1 and SPECT-2, despite the differences between these groups in the severity of perfusion defects, or the clinical ischemic response. This may be due to the low sensitivity of the ECG during dipyridamole stress.

Mechanism of influence of antianginal drugs on dipyridamole perfusion imaging combined with submaximal exercise. Antianginal drugs may lead to underestimation of CAD, as evaluated by myocardial perfusion imaging after dipyridamole plus submaximal exercise, through several mechanisms, one of which is a reduction of the exercise level achieved. This mechanism, however, seems unlikely because dipyridamole combined with low level exercise (peak HR <80% of predicted value for age) demonstrated a negative predictive value and sensitivity for detection of CAD, comparable to exercise (22–29). Moreover, the fact that changes in HR, BP and rate–pressure product in the present study were similar in SPECT-1 and SPECT-2 implies that the level of hemodynamic stress was similar in the two perfusion studies. Therefore, the main mechanism responsible for reducing the size and severity of reversible perfusion defects by antianginal drugs was probably not due to changes in oxygen consumption during the treadmill exercise after dipyridamole injection. Most patients in our study were taking nitrates (73%), calcium antagonists (81%) or a combination of these, and only 8 patients (31%) were taking beta-blockers at the time of SPECT-2. Indeed, there was no significant difference in baseline HR in the two dipyridamole studies, although baseline BP was lower during SPECT-2.

Interference with the acute hyperemic response and redistribution of blood flow induced by dipyridamole is a possible mechanism by which antianginal coronary vasodilators such as nitrates and calcium antagonists may influence myocardial perfusion imaging after dipyridamole administration. In exper-
imal studies, Fam and McGregor (30,31) reported that nitroglycerin reduced coronary vascular resistance of large epicardial arteries, whereas dipyridamole reduced the resistance of distal (resistive) arteries. Other studies (32,33) demonstrated that dipyridamole induced a significant increase in coronary flow of normally perfused myocardium, coupled with a reduced flow reserve in the area supplied by a stenotic coronary artery, resulting in inhomogeneity of regional myocardial perfusion. In addition, transmural coronary steal of blood flow from subendocardial to subepicardial regions occurred owing to an absolute decrease of subendocardial flow in the stenotic artery region (34–36). In contrast, nitroglycerin has been shown to increase flow to ischemic myocardium, while maintaining nonischemic flow (30,36–39). The endocardial to epicardial flow ratio increased during intravenous nitroglycerin infusion. These influences of nitrates on regional blood flow in the presence of occlusive coronary disease are the consequence of vasodilation of large conductance coronary arteries, coronary collateral vessels and atherosclerotic stenoses (40–43) and are responsible for the angina-relieving effect of nitrates. Another mechanism whereby nitrates might interfere with the action of dipyridamole is the reduction of left ventricular volume secondary to decreased venous return (44,45), resulting in decreased myocardial oxygen consumption (46) and improved subendocardial blood flow.

Calcium antagonists exert a direct vasodilatory effect on large epicardial vessels as well as resistance vessels and increase blood flow to normal myocardium as well as ischemic myocardium (42,43). These counteracting effects of antianginal drugs (nitrates and calcium antagonists), on the one hand, and dipyridamole, on the other, may explain the underestimation of CAD demonstrated in the present study.

Study limitations. The small number and heterogeneity of the patients included in this study were partially compensated for by the fact that all patients underwent two imaging tests (with and without antianginal drugs), thereby strengthening the statistical power of the study. The possibility of patients consuming caffeinated beverages against our instruction, and thereby potentially confounding the differences between the results of SPECT-1 and SPECT-2, cannot be excluded because blood caffeine levels were not compared. However, before each test each patient was routinely asked about possible caffeine consumption. In addition, there was only one habitual coffee drinker of the 10 patients, with the largest differences between the two studies, making this an unlikely potential confounder.

Conclusions. We demonstrated that continuation of antianginal therapy up to the day of the dipyridamole thallium-201 SPECT myocardial perfusion imaging test may cause underestimation of the magnitude of CAD. The fact that previous administration of various antianginal drugs may lead to underestimation of both the size and severity of ischemia, as well as to decreased sensitivity of this test for detecting multivessel disease, should be taken into consideration by the clinician.

Moreover, the question whether reduced ischemia in patients taking a specific group of antianginal drugs represents a “technical” underestimation or a preventive therapeutic effect of these drugs remains to be answered. Further investigation is required to assess the role of each individual drug group on dipyridamole thallium-201 myocardial perfusion imaging. Meanwhile, unless contraindicated, we recommend discontinuing these drugs before the test.

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References
