Dobutamine Stress Echocardiography for Assessment of Perioperative Cardiac Risk in Patients Undergoing Major Vascular Surgery

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**Background.** The purpose of this study was to determine the predictive value of dobutamine stress echocardiography for perioperative cardiac events in patients scheduled for elective major noncardiac vascular surgery.

**Methods and Results.** Patients (n = 136; mean age, 68 years) unable to exercise underwent a dobutamine stress test before surgery (incremental dobutamine infusion [10–40 µg·kg⁻¹·min⁻¹] continued with atropine [0.25–1 mg iv.] if necessary to achieve 85% of the age-predicted maximal heart rate without symptoms or signs of ischemia). The clinical risk profile was evaluated by Detsky's modification of Goldman's risk factor analysis. Echocardiographic images were evaluated by two observers blinded to the clinical data of the patients, and results of the test were not used for clinical decision making. Technically adequate images were obtained in 134 of 136 patients, one major complication occurred (ventricular fibrillation), and three tests were discontinued prematurely because of side effects. Finally, data from 131 patients were analyzed with univariate and multivariate methods. The dobutamine stress test was positive (new or worsened wall motion abnormality) in 35 of 131 patients. In the postoperative period, five patients died of myocardial infarction, nine patients had unstable angina, and one patient developed pulmonary edema. All patients with cardiac complications (15 patients) had a positive dobutamine stress test. No cardiac events occurred in patients with negative tests. Five patients with a technically inadequate or prematurely stopped test were operated on without complications. By multivariate analysis (logistic regression), only age >70 years and new wall motion abnormalities during the dobutamine test were significant predictors of perioperative cardiac events.

**Conclusions.** Dobutamine stress echocardiography is a feasible, safe, and useful method for identifying patients at high or low risk of perioperative cardiac events. The test yields additional information, beyond that provided by clinical variables, in patients who are scheduled for major noncardiac vascular surgery.

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**KEY WORDS •** dobutamine • echocardiography, stress • surgery, vascular • risk factors

Perioperative cardiovascular complications such as myocardial infarction, unstable angina, pulmonary edema, and serious ventricular arrhythmias are potentially avoidable causes of mortality and morbidity in surgical patients. Theoretically, if patients with a high risk of cardiac complications can be identified before surgery, their management can be altered and the chance of an adverse outcome reduced. This is particularly relevant in candidates for major noncardiac vascular surgery, who have a relatively high rate of cardiovascular complications. This reflects primarily the high prevalence of coronary artery disease, ranging from 25% to 90% depending on the patient selection and diagnostic method used, in this population.

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Several methods have been described for risk stratification in these patients, including multifactorial clinical scoring systems, ambulatory ECG monitoring, radionuclide ventriculography, pharmacological myocardial perfusion imaging, and angiocardiology. It has been suggested that the most accurate information can be derived by adding clinical data to those obtained by dipyridamole myocardial perfusion imaging. Nuclear studies may not be available in all hospitals, however, and they are relatively expensive. Therefore, a more available and less expensive test would be very desirable. The applicability of stress echocardiography in this clinical setting is potentially significant. Initial results with dipyridamole and dobutamine stress echocardiography have been promising. In the reported series, however, stress
Dobutamine stress echocardiography was performed in relatively small numbers of patients. Accordingly, this study was designed to assess prospectively the predictive value of clinical information and dobutamine stress echocardiography for identification of individuals at high and low risk of perioperative cardiac complications. A group of consecutive patients undergoing major noncardiac vascular surgery was studied.

Methods

Patient Population

One hundred thirty-six consecutive patients (116 men and 20 women) scheduled for elective vascular surgery at the University Hospital Dijkzigt from May 1991 to July 1992 were screened. Fifty-one patients underwent abdominal aortic aneurysm resection, 46 aortobifemoral bypass, and 39 infrainguinal arterial reconstruction. Patients undergoing emergency procedures were not enrolled. All patients underwent a routine clinical evaluation, including a detailed clinical history, a physical examination, and a 12-lead ECG. Cardiac risk assessment was based on Detsky's modification of Goldman's cardiac risk index. Variables used for scoring were previous myocardial infarction, angina pectoris, left ventricular failure, arrhythmias, age, and poor general condition. Detsky scores were calculated for each patient. Risk factors for vascular disease (hypertension, diabetes, smoking) were also analyzed. No patient underwent perfusion stress scintigraphy, coronary angiography, or prophylactic myocardial revascularization before surgery.

Dobutamine Stress Echocardiography

Dobutamine stress echocardiography was performed as previously described. In short, after giving verbal informed consent, the patients underwent a resting two-dimensional precordial echocardiographic examination. Standard apical and parasternal views were recorded on videotape, and a baseline 12-lead ECG was recorded. Dobutamine was then administered intravenously by infusion pump, starting at 10 \( \mu g \cdot kg^{-1} \cdot min^{-1} \) for 3 minutes, increasing by 10 \( \mu g \cdot kg^{-1} \cdot min^{-1} \) every 3 minutes to a maximum of 40 \( \mu g \cdot kg^{-1} \cdot min^{-1} \) (stage 4), and continued for 6 minutes. In patients who did not achieve 85% of their age-predicted maximal heart rate and who had no symptoms or signs of ischemia, atropine (starting with 0.25 mg and increasing to a maximum of 1 mg) was given intravenously at the end of stage 4, while dobutamine was continued. Throughout dobutamine infusion, the ECG was continuously monitored, the 12-lead ECG was recorded each minute, and blood pressure was measured by sphygmomanometry every 3 minutes. The two-dimensional echocardiogram was continuously monitored and recorded on videotape during the final minute of each stage. Metoprolol was available and was used to reverse the effects of dobutamine or atropine if these did not revert spontaneously and quickly. Off-line assessment of echocardiographic images was performed by two experienced investigators without knowledge of the patients' clinical data or perioperative outcome but with knowledge of the doses of dobutamine and atropine used. When there was disagreement between these two assessors, a third investigator viewed the images without knowledge of the previous assessments, and a majority decision was achieved. For this semiquantitative assessment, the left ventricular wall was divided into 14 segments, and each was scored on a four-point scale: 1, normal; 2, hypokinetic; 3, akinetic; and 4, dyskinetic. An increase in score between rest and stress in one or more segments, that is, a new or worsened wall motion abnormality, constituted a positive test. Absence of a hyperkinetic response to dobutamine was not considered a positive result. We have previously shown excellent interobserver and intraobserver reproducibility in interpretation of stress echocardiography, of 91 and 92%, respectively. In addition, the reproducibility of wall motion abnormalities during dobutamine-atropine stress echocardiography was 100% in 23 patients who underwent serial studies on different days. The results of the test were not provided to the attending physicians responsible for clinical management. Therefore, in contrast to most previous studies with dipyridamole thallium scintigraphy, the present study was not limited by a referral bias that could influence the results of the study. The protocol was approved by the hospital ethics committee.

Postoperative Follow-up

Patients were followed throughout their stay in the hospital. On postoperative days 1, 3, and 7, serum creatine kinase with MB fraction was measured and a 12-lead ECG was recorded. All measurements, such as ECG, cardiac isoenzyme determination, and echocardiography, were repeated whenever necessary, at the discretion of the treating physicians. Adverse cardiac outcomes included 1) cardiac death (based on clinical assessment, ECG, and if possible, autopsy), 2) myocardial infarction documented by ECG and cardiac isoenzymes, 3) unstable angina consisting of chest pain at rest with transient ischemic ECG changes requiring prolonged stay or readmission to the intensive care unit and intravenous treatment with nitrates, 4) sustained ventricular dysrhythmias, and 5) pulmonary edema of cardiogenic origin based on clinical assessment and pulmonary artery pressures obtained with a Swan-Ganz catheter.

Statistical Analysis

Univariate analysis for categorical variables was performed with the \( \chi^2 \) test with Yates' correction or Fisher's exact test. Continuous variables were analyzed by Student's \( t \) test. Stepwise logistic regression models were fitted to identify independent predictors of a cardiac event (all variables, regardless of significance from the univariate analysis, were entered into the multivariate analysis). The difference in risk was expressed as the odds ratio with the corresponding 95% confidence intervals (CI). Differences were considered significant if the null hypothesis could be rejected at the 0.05 probability level.

Results

Patient Characteristics

The mean age of the patients was 68 years (range, 30–90 years). There were 116 men and 20 women. Patients with atrial fibrillation and/or left bundle branch block were included in the study, although none of the
patients had atrial fibrillation at the start of dobutamine infusion. Two patients had a preexisting history of ventricular arrhythmias, one of whom developed ventricular fibrillation during the test. A history of arterial hypertension was present in 53 patients, 15 had diabetes mellitus (all on drug therapy), and there were 65 smokers. A history of coronary disease was present in 56 patients (myocardial infarction in 32 patients, angina pectoris in seven patients, and both angina and old infarction in 17 patients). Among those who had no history of coronary disease, one or more risk factors for vascular disease (hypertension, diabetes mellitus, and smoking) were reported in 38 patients. When classified according to Detsky’s score, one patient had >30 points, seven patients had 16–30 points, and 123 patients had 0–15 points (Table 1).

**Dobutamine Stress Test**

Technically adequate echocardiographic images were obtained in 134 of 136 patients during the dobutamine stress test. Two patients were excluded from the study because of uninterpretable image quality. All but five patients tolerated the maximum dobutamine dose.

Major side effects occurred in two patients. One patient developed ventricular fibrillation during the peak dose of dobutamine but was successfully resuscitated (one single countershock) without evidence of new myocardial infarction as shown by echocardiography, ECG, and cardiac isoenzyme determinations. One patient had paroxysmal atrial fibrillation in the recovery phase of the test, which rapidly reverted to sinus rhythm after metoprolol. Three tests were discontinued prematurely because of side effects. Rapidly increasing blood pressure (240/130 mm Hg in stage 1) was the reason for discontinuing the test in one patient with an abdominal aortic aneurysm. In two other patients, the test was stopped because of intolerable chills and shivering. Eight other patients experienced minor side effects that did not prevent completion of the test (headache, tolerable chills, numerous premature ventricular contractions).

The dobutamine stress test was completed in 131 of 136 patients (96%). Addition of atropine to the peak dobutamine dose was required in 39 of 131 patients. Patients on β-blockers required atropine more often (13 of 23) than patients not on β-blockers (p=0.004, patients with versus without β-blockers). Metoprolol (1–5 mg) was administered to reverse the adverse effects of dobutamine and/or atropine, such as tachycardia persisting longer than 5 minutes or ischemia not resolving soon after the dobutamine infusion was stopped.

New wall motion abnormalities were detected during the dobutamine stress test in 35 patients; seven of these patients had a normal resting echocardiogram, nine patients developed new wall motion abnormalities in regions with asynergy, and 19 patients worsened of an existing wall motion abnormality. Improvement of existing wall motion abnormalities was observed in seven patients. Five patients had a left bundle branch block, making interpretation of ST segment changes impossible. ST depression or elevation >1 mm occurred in 34 cases and typical angina in 13 cases. Table 2 summarizes the results of dobutamine stress testing.

**Postoperative Cardiac Events**

In the postoperative period, 15 patients experienced cardiac complications (Table 3). All complications occurred between postoperative days 1 and 7. Five patients suffered fatal postoperative myocardial infarction, nine had unstable angina, and one developed acute pulmonary edema.

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**Table 1. Clinical Scoring System for Cardiac Event Risk**

<table>
<thead>
<tr>
<th>Cardiac risk index</th>
<th>Cardiac events (n=15 patients)</th>
<th>No cardiac events (n=116 patients)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detsky score</td>
<td>13.2±6.4</td>
<td>6.7±6.0</td>
<td>&lt;0.02</td>
</tr>
<tr>
<td>Range</td>
<td>0–35</td>
<td>0–30</td>
<td>NS</td>
</tr>
<tr>
<td>0–15 Points</td>
<td>13</td>
<td>110</td>
<td>NS</td>
</tr>
<tr>
<td>16–30 Points</td>
<td>1</td>
<td>6</td>
<td>NS</td>
</tr>
<tr>
<td>&gt;30 Points</td>
<td>1</td>
<td>0</td>
<td>NS</td>
</tr>
</tbody>
</table>

**Table 2. Univariate Analysis of Clinical Data and Dobutamine Stress Test**

<table>
<thead>
<tr>
<th></th>
<th>Cardiac events (n=15 patients)</th>
<th>No cardiac events (n=116 patients)</th>
<th>OR</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years (range)</td>
<td>70 (50–86)</td>
<td>68 (35–90)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;70 Years (No.)</td>
<td>9</td>
<td>46</td>
<td>2.3</td>
<td>0.7–7.8</td>
</tr>
<tr>
<td>Sex (M/F)</td>
<td>11/4</td>
<td>100/16</td>
<td>0.44</td>
<td>0.1–1.9</td>
</tr>
<tr>
<td>History of angina</td>
<td>7</td>
<td>17</td>
<td>5.1</td>
<td>1.4–18</td>
</tr>
<tr>
<td>History of infarction</td>
<td>10</td>
<td>39</td>
<td>4.0</td>
<td>1.1–14.4</td>
</tr>
<tr>
<td>Hypertension</td>
<td>4</td>
<td>49</td>
<td>0.5</td>
<td>0.1–1.8</td>
</tr>
<tr>
<td>Smoking</td>
<td>8</td>
<td>57</td>
<td>1.2</td>
<td>0.4–3.9</td>
</tr>
<tr>
<td>Diabetes</td>
<td>4</td>
<td>11</td>
<td>3.5</td>
<td>0.8–14.8</td>
</tr>
<tr>
<td>Aortic/infrainguinal surgery</td>
<td>10/5</td>
<td>84/32</td>
<td>0.8</td>
<td>0.2–2.8</td>
</tr>
<tr>
<td>Angina during test</td>
<td>3</td>
<td>10</td>
<td>2.7</td>
<td>0.5–12.7</td>
</tr>
<tr>
<td>ST changes during test</td>
<td>7</td>
<td>31</td>
<td>2.4</td>
<td>0.7–8.1</td>
</tr>
<tr>
<td>WMA at rest</td>
<td>10</td>
<td>47</td>
<td>2.9</td>
<td>0.9–10.6</td>
</tr>
<tr>
<td>Severe LV dysfunction at rest</td>
<td>3</td>
<td>14</td>
<td>1.8</td>
<td>0.4–8.3</td>
</tr>
<tr>
<td>NWMA during test</td>
<td>15</td>
<td>20</td>
<td>72</td>
<td>9.0–577</td>
</tr>
</tbody>
</table>

OR, odds ratio; CI, 95% confidence intervals; WMA, any abnormality of wall motion; severe left ventricular (LV) dysfunction at rest ≥10 of 14 abnormal left ventricular segments; NWMA, new wall motion abnormalities.
The clinical features of patients with and without perioperative cardiac events and a complete dobutamine stress test are compared in Tables 1 and 2. The Detsky score was significantly higher in patients with perioperative complications, but the scoring system was not useful for risk stratification. Thirteen of 15 patients with cardiac events were in the lower-risk category (0–15 points). Significant univariate clinical predictors of a cardiac event included a history of angina pectoris (odds ratio, 5.1; CI, 1.4–18) and old myocardial infarction (odds ratio, 4.0; CI, 1.1–14.4). Of five patients with a fatal myocardial infarction, four had suffered a previous myocardial infarction. However, risk factors for cardiovascular disease (hypertension, smoking, and diabetes mellitus), type of operation procedure (aortic versus peripheral surgery), and age >70 years were not univariate predictors of perioperative outcome. In contrast to clinical information, dobutamine stress echocardiography was much more useful for risk assessment. All 15 patients with perioperative cardiac events had a positive test (odds ratio, 72; CI, 9.0–557), whereas the test was positive in only 20 of 116 patients without events. Other signs of ischemia during the test, such as chest pain and ST segment changes, were not predictive of cardiac events (odds ratio, 2.7; CI, 0.6–11.0 and odds ratio, 2.4; CI, 0.8–7.2, respectively).

A multivariate analysis of clinical and dobutamine stress test variables revealed only two independent predictors of a cardiac event (Table 4). Patients with a positive dobutamine stress test (occurrence of new wall motion abnormalities) were 95 (CI, 11–823) times more likely to have a perioperative cardiac event. Age >70 years was the only clinical parameter (odds ratio, 6.0; CI, 1.28–27.9) independently associated with a greater risk of a perioperative cardiac event. The positive predictive value of dobutamine stress echocardiography was 42% (15 of 35), and the negative predictive value was 100%.

Discussion

Preoperative cardiac risk stratification of patients undergoing major vascular surgery is a challenge. A combination of clinical evaluation and dipyridamole 201Tl myocardial scintigraphy has been reported to provide the most useful and efficient prognostic information.10,22,40 Recently, numerous publications have appeared regarding the safety, feasibility, and diagnostic accuracy of stress echocardiography for eliciting myocardial ischemia after both exercise36 and pharmacological interventions like dipyridamole and dobutamine administration.30–33,41–44 These studies indicate that in experienced hands, stress echocardiography represents an attractive alternative30 in most situations where myocardial perfusion scintigraphy is applied.43

### Table 3. Clinical Data on Patients With Perioperative Cardiac Events

<table>
<thead>
<tr>
<th>Patient</th>
<th>Preoperative clinical data</th>
<th>DSE</th>
<th>Perioperative event</th>
<th>Time after surgery (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age (years)</td>
<td>HTN</td>
<td>DM</td>
<td>Smoking</td>
</tr>
<tr>
<td>1</td>
<td>70</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>76</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>76</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>62</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>85</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>83</td>
<td>+</td>
<td>-</td>
<td>+</td>
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<tr>
<td>7</td>
<td>50</td>
<td>+</td>
<td>+</td>
<td>-</td>
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<tr>
<td>8</td>
<td>72</td>
<td>-</td>
<td>+</td>
<td>-</td>
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<tr>
<td>9</td>
<td>76</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>76</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>11</td>
<td>73</td>
<td>+</td>
<td>-</td>
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<td>12</td>
<td>77</td>
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<tr>
<td>13</td>
<td>51</td>
<td>-</td>
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<tr>
<td>14</td>
<td>72</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>15</td>
<td>66</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>

DSE, dobutamine stress echocardiography; HTN, hypertension; DM, diabetes mellitus; AP, history of angina pectoris; MI, myocardial infarction; Detsky, Detsky's score; Med., antianginal medication; NWMA, new or worsened wall motion abnormality; CHF, chest pain during stress echo; ST, ST changes >1 mm during stress echocardiography; -, negative; +, positive; inf., inferior; ant., anterior; RBBB, right bundle branch block; LVH, left ventricular hypertrophy; UAP, unstable angina pectoris.

### Table 4. Multivariate Analysis of Clinical Data and Dobutamine Stress Test

<table>
<thead>
<tr>
<th>Age &gt;70 years (No.)</th>
<th>Cardiac events (n=15 patients)</th>
<th>No cardiac events (n=116 patients)</th>
<th>OR</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWMA during test</td>
<td>9</td>
<td>46</td>
<td>6.0</td>
<td>1.28–27.9</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>20</td>
<td>95</td>
<td>11.0–822</td>
</tr>
</tbody>
</table>

OR, odds ratio; CI, 95% confidence intervals; NWMA, new wall motion abnormalities.
Our study shows that dobutamine stress echocardiography can also be used before major vascular surgery to accurately define a subgroup of patients at high risk of perioperative cardiac complications. Wall motion abnormalities induced by dobutamine were the most important predictors of perioperative cardiac events. In contrast, wall motion abnormalities at rest and other signs and symptoms of ischemia during the test were not predictive.

In addition to detecting deterioration in regional wall motion, echocardiography may also reveal improvement in wall motion during dobutamine infusion. Reversal of existing wall motion abnormality may indicate the presence of hibernating myocardium. Improvement during the test was seen in seven patients, who all had an uneventful perioperative clinical course. Severe left ventricular dysfunction at rest (defined by echocardiography as ≥10 of 14 abnormal left ventricular segments), which may warrant specific fluid balance monitoring, was not an independent risk factor for cardiac events.

Clinical data, combined in a risk index such as Detsky's score, provided little information on individual perioperative cardiac risk. Although Detsky's score was significantly higher in the cardiac event group than in the noncardiac event group, there was a large overlap between the patients with and without events.

The presence of coronary artery disease, indicated by typical angina pectoris or old myocardial infarction, correlated positively with cardiac events. By multivariate regression analysis, the presence of new wall motion abnormalities during dobutamine was the most powerful independent predictor of perioperative events, followed by age >70 years. Risk factors for vascular disease, such as smoking, diabetes mellitus, and hypertension, were not correlated with cardiac events.

There were two major side effects during dobutamine stress echocardiography. One patient developed ventricular fibrillation during the peak dose of dobutamine, along with echocardiographic and ECG evidence of myocardial ischemia. This patient, with a previous myocardial infarction, was successfully resuscitated without evidence of a new infarction. Because of an expanding abdominal aneurysm, he underwent surgery 1 week later without complications.

The other major side effect was paroxysmal atrial fibrillation occurring during the recovery phase of the test, which responded rapidly to metoprolol. The dobutamine stress test has been performed about 500 times in our institution for various indications, including this study, with one major complication in the form of ventricular fibrillation. Although the number of patients is still small, this represents an event rate of 0.2%, which would be comparable to that of dipyridamole thallium scintigraphy.

Perhaps the absence of serious side effects in some previous dobutamine stress echocardiographic studies was a result of the use of a lower dobutamine dose and the avoidance of atropine. The peak dobutamine dose of 40 μg · kg⁻¹ · min⁻¹ was reached in 118 of 131 patients, and atropine was then added if the target heart rate (expressed as 85% of age-predicted maximal heart rate) had not been achieved and if signs or symptoms of ischemia were absent. Atropine was given in 39 of 131 patients. We believe the high dose of dobutamine is necessary to provoke adequate myocardial stress and subsequent ischemia. Additional atropine was most frequently required in patients on β-blockers who did not achieve an adequate heart rate response to dobutamine.

The results of the present study are similar to those recently published on a smaller group of 60 patients studied by Lalka et al with dobutamine stress echocardiography. Those authors found a positive predictive value of the test for perioperative events of 29% and a negative predictive value of 95%. The results we obtained by dobutamine stress echocardiography are also similar to those reported by Tischler et al with dipyridamole echocardiography. They found that a positive test indicated a relative risk of having a cardiac event after vascular surgery of 78 (CI, 11–564) using the dobutamine stress test; we found that a positive test indicated a relative risk of 42 (CI, 5.7–303). Tischler et al also found an excellent negative predictive value of dipyridamole echocardiography (only one event among 100 patients with a negative test). The similar prognostic information provided by dobutamine and dipyridamole stress echocardiography is also consistent with recent studies indicating that the values of the two tests are very similar for the diagnosis of coronary disease despite their different mechanism of action.

Our data and those of Tischler suggest that pharmacological stress echocardiography may be an alternative to nuclear studies for preoperative risk stratification. Compared with nuclear studies, stress echocardiography is likely to be less expensive in many hospitals, as long as the number of technically inadequate studies is low. In our hospital, dipyridamole thallium scintigraphy costs about $531 compared with about $185 for dobutamine stress echocardiography.

The positive predictive value of a positive dobutamine stress echocardiography is at least comparable to dipyridamole thallium scintigraphy (42% versus 30%) when data obtained from 15 studies are used for comparison. These studies were published from 1985 to 1991 and contain the results of 1,204 patients tested before surgery by dipyridamole ²⁰¹¹Tl myocardial perfusion scintigraphy. There are several possible explanations for the high sensitivity of dobutamine stress echocardiography in our study. First, the results of the test were not provided to the attending physicians and did not influence clinical management. Second, the patients studied had a high prevalence of documented coronary artery disease (41%). Finally, thallium scintigraphy detects both myocardial ischemia and maldistribution of flow, whereas stress echocardiography has a high specificity for myocardial ischemia.

One potential limitation of the present study and of other similar studies is the subjective nonquantitative interpretation of echocardiographic images. However, this was always done by two investigators blinded to the clinical information and the outcome of surgery. In summary, our study shows that dobutamine stress echocardiography is an extremely promising new tool for risk stratification in patients who are candidates for major vascular surgery and may be an alternative to nuclear myocardial perfusion studies.
References


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