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Should Major Vascular Surgery Be Delayed Because of Preoperative Cardiac Testing in Intermediate-Risk Patients Receiving Beta-Blocker Therapy With Tight Heart Rate Control?

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OBJECTIVES The purpose of this study was to assess the value of preoperative cardiac testing in intermediate-risk patients receiving beta-blocker therapy with tight heart rate (HR) control scheduled for major vascular surgery.

BACKGROUND Treatment guidelines of the American College of Cardiology/American Heart Association recommend cardiac testing in these patients to identify subjects at increased risk. This policy delays surgery, even though test results might be redundant and beta-blockers with tight HR control provide sufficient myocardial protection. Furthermore, the benefit of revascularization in high-risk patients is ill-defined.

METHODS All 1,476 screened patients were stratified into low-risk (0 risk factors), intermediate-risk (1 to 2 risk factors), and high-risk (≥3 risk factors). All patients received beta-blockers. The 770 intermediate-risk patients were randomly assigned to cardiac stress-testing (n = 386) or no testing. Test results influenced management. In patients with ischemia, physicians aimed to control HR below the ischemic threshold. Those with extensive stress-induced ischemia were considered for revascularization. The primary end point was cardiac death or myocardial infarction at 30-days after surgery.

RESULTS Testing showed no ischemia in 287 patients (74%); limited ischemia in 65 patients (17%), and extensive ischemia in 34 patients (8.8%). Of 34 patients with extensive ischemia, revascularization before surgery was feasible in 12 patients (35%). Patients assigned to no testing had similar incidence of the primary end point as those assigned to testing (1.8% vs. 2.3%; odds ratio [OR] 0.78; 95% confidence interval [CI] 0.28 to 2.1; p = 0.62). The strategy of no testing brought surgery almost 3 weeks forward. Regardless of allocated strategy, patients with a HR <65 beats/min had lower risk than the remaining patients (1.3% vs. 5.2%; OR 0.24; 95% CI 0.09 to 0.66; p = 0.003).

CONCLUSIONS Cardiac testing can safely be omitted in intermediate-risk patients, provided that beta-blockers aiming at tight HR control are prescribed. (J Am Coll Cardiol 2006;48:964–9)
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According to the guidelines of the American College of Cardiology /American Heart Association (ACC/AHA), all patients scheduled for major vascular surgery who have clinical features associated with increased cardiac risk should undergo noninvasive cardiac stress-testing (1). Perioperative beta-blocker therapy is recommended for patients with inducible ischemia undergoing major vascular surgery. The guidelines also recommend coronary angiography for patients with high-risk noninvasive test results and myocardial revascularization in patients with prognostic high-risk anatomy in whom long-term outcome is likely to be improved. However, noninvasive testing might delay surgery and run the risk of aortic aneurysmal rupture or exacerbation of critical limb ischemia. Furthermore, a recent randomized, controlled trial of preoperative myocardial revascularization in vascular surgery patients showed no improvement in perioperative or long-term outcome associated with prophylactic revascularization (2).

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In a previous retrospective observational study of 1,351 patients undergoing major vascular surgery, we found that counting clinical risk factors effectively stratified vascular surgery patients into low-risk (0 risk factors), intermediate-

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Abbreviations and Acronyms

ACC/AHA = American College of Cardiology/ American Heart Association
CI = confidence interval
MI = myocardial infarction
OR = odds ratio

risk (1 to 2 risk factors), and high-risk (≥3 risk factors) categories (3). Among patients receiving beta-blockers, perioperative cardiac event rates were 0% and 0.9% in low- and intermediate-risk patients, respectively. Of all intermediate-risk patients studied, only a minority (2%) experienced extensive stress-induced myocardial ischemia (3). These data do not support the routine use of preoperative noninvasive testing in intermediate-risk patients, who constitute more than 50% of the major vascular surgery population, provided that perioperative beta-blockade is employed.

We therefore undertook the second multi-center DECREASE-II (Dutch Echocardiographic Cardiac Risk Evaluation) study to prospectively assess the value of cardiac testing according to the ACC/AHA guidelines in intermediate-risk patients receiving beta-blocker therapy with tight heart rate (HR) control scheduled for major vascular surgery.

METHODS

Study protocol. Between 2000 and 2005, we enrolled 1,476 patients undergoing elective open abdominal aortic or infrainguinal arterial reconstruction at 5 participating centers. Patients were screened for the following cardiac risk factors: age over 70 years, angina pectoris, prior myocardial infarction (MI) on the basis of history or a finding of pathologic Q waves on electrocardiography, compensated congestive heart failure or a history of congestive heart failure, drug therapy for diabetes mellitus, renal dysfunction (serum creatinine >160 μmol/l), and prior stroke or transient ischemic attack.

On the basis of previous study results, patients were divided into 3 groups: 0 risk factors (low-risk), 1 or 2 risk factors (intermediate-risk), ≥3 risk factors (high-risk) (3). Low-risk patients were referred for surgery with beta-blocker therapy without additional testing. Intermediate-risk patients were randomly (1:1) assigned to preoperative cardiac stress-testing or no testing. Cardiac testing was performed by dobutamine echocardiography or dobutamine or dipyridamole perfusion scintigraphy, as previously described (4,5). Test results were scored by the extent of stress-induced ischemia with a 16-segment model in dobutamine echocardiography and a 6-wall model in stress perfusion scintigraphy. In addition during dobutamine echocardiography, the HR at which ischemia occurred (i.e., ischemic HR threshold) was noted. Limited ischemia was defined by the presence of 1 to 4 ischemic segments or 1 to 2 ischemic walls, whereas extensive ischemia was defined by ≥5 ischemic segments or ≥3 ischemic walls. Patients without ischemia as well as those with limited ischemia were referred for surgery with beta-blocker therapy. In patients with extensive ischemia, test results were discussed with the treating physicians and only in those patients in whom the index surgical procedure could be delayed was coronary angiography performed and revascularization considered after the angiography data were obtained. The type of coronary revascularization, bypass surgery or percutaneous coronary intervention, was decided by the treating physicians on the basis of coronary anatomy and the possible delay of the index surgical procedure. High-risk patients were referred for additional cardiac testing. All patients provided written informed consent, and the study was approved by the Erasmus Medical Center medical ethics committee and local research ethics committees.

Beta-blocker therapy. Perioperative beta-blocker therapy was installed in all patients. Patients receiving chronic beta-blocker therapy continued their medication. Patients without beta-blockers started with bisoprolol 2.5 mg once/day at the screening visit. Beta-blocker dose was adjusted in all patients at admission to the hospital and on the day before surgery to achieve a resting HR of 60 to 65 beats/min. The same dose of beta-blockers was continued postoperatively except in patients who were unable to take medication orally or by nasogastric tube postoperatively. In these patients, the HR was monitored continuously in the intensive care unit or hourly at the ward, and intravenous metoprolol was administered at a dose sufficient to keep the HR between 60 and 65 beats/min. The HR and blood pressure were measured immediately before each scheduled dose of beta-blockers. Beta-blockers were withheld if the HR was under 50 beats/min or the systolic blood pressure was under 100 mm Hg. After discharge, patients continued beta-blocker therapy and dose adjustments were carried out during outpatient visits to achieve a resting HR of 60 to 65 beats/min.

Perioperative management. Anesthetic management, monitoring, surgical technique, and other aspects of perioperative management were at the discretion of the attending physician. Results of preoperative testing and coronary revascularization were discussed with the attending physicians. In patients with limited or extensive ischemia, HR and hemodynamic management during surgery was implemented to control HR below the ischemic threshold and otherwise below 65 beats/min. Anticoagulant and antiplatelet therapy were continued for a period of at least 4 weeks after percutaneous coronary intervention and continued during surgery. Intraoperative ischemia was treated at the discretion of attending physicians, and additional beta-blockers were permitted.

End point definition. All patients were monitored for cardiac events during hospital stay after surgery. Twelve-lead electrocardiography and serum troponin-T level was determined 1, 3, 7, and 30 days after surgery. Additional tests were performed at the discretion of the attending physician. Outpatient follow-up was performed at 30 days if a patient had been discharged from the hospital. At the outpatient clinic all patients were screened at 3-month