



with acute coronary syndromes, those with left main disease, those with two-vessel coronary disease who have significant proximal left anterior descending artery stenosis and either ischemia on noninvasive testing or reduced left ventricular ejection fraction, and those with three-vessel coronary vessel disease and an ejection fraction of less than 50%. Routine prophylactic coronary revascularization should not be performed in patients with stable CAD before noncardiac surgery. An RCRI score of 3 or higher in a patient with severe myocardial ischemia suggestive of left main or three-vessel disease should lead to consideration of coronary revascularization before noncardiac surgery in appropriate patients.

Noninvasive cardiac testing is most appropriate if it is anticipated that the patient will meet guidelines for initiation of additional medical therapy or coronary angiography and coronary revascularization in the event of a positive test. Noninvasive stress testing of patients with three or more clinical risk factors and poor functional capacity (<4 METS) who require vascular surgery is reasonable, provided that the result might change future management. When feasible, exercise stress testing is the modality of choice and offers the benefit of an objective assessment of functional capacity. Pharmacologic stress tests may be performed instead of exercise tests; they are typically reserved for patients with functional limitations.

Dobutamine echocardiography and nuclear perfusion testing for purposes of identifying patients at risk for perioperative MI or death have excellent negative predictive values (near 100%) but poor positive predictive values (<20%). Therefore, a negative study is reassuring, but a positive study is still only a weak predictor of a “hard” perioperative cardiac event. Which higher-risk patients are most likely to benefit from preoperative noninvasive cardiac testing and treatment strategies to improve outcomes is not well defined.

Choices of Noninvasive Cardiac Testing

The choice among noninvasive tests should be based on the need to assess valvular or ventricular function and on which test is most reliable and available locally. Dobutamine stress echocardiography is often used because it has excellent overall predictive performance and can provide additional information about valvular and left ventricular dysfunction.

In general, poor functional capacity associated with exercise-induced ischemia indicates a higher risk for perioperative cardiac events, and achievement of an excellent workload indicates a lower risk. The ability to attain 75% to 85% of the maximal age-predicted heart rate is predictive of a lower rate of perioperative cardiac events. In patients with baseline ECG abnormalities (e.g., left bundle branch block, left ventricular hypertrophy with repolarization abnormalities, Wolff-Parkinson-White pattern, changes secondary to digoxin therapy, paced rhythms) and in those with an inability to exercise due to comorbid conditions, pharmacologic stress echocardiography or nuclear imaging is preferred.

Studies of myocardial perfusion imaging methods (with thallium 201 and technetium 99m) have shown that reversible perfusion defects, which reflect jeopardized viable myocardium, confer the greatest risk for adverse perioperative outcomes. The uniformly high negative predictive value of a normal myocardial perfusion scan may make this technique particularly useful when

noninvasive testing is pursued. In most studies, fixed perfusion defects do not have significant predictive value for perioperative cardiac events. Coronary vasodilators (e.g., intravenous dipyridamole, adenosine, regadenoson), which induce a “coronary steal” phenomenon, are the preferred pharmacologic agents to use with radionuclide myocardial perfusion imaging.

With dobutamine stress echocardiography, the number of myocardial segments demonstrating wall motion abnormalities or wall motion changes at low dobutamine infusion rates identifies patients who are at higher risk for perioperative cardiac events. Dobutamine should be avoided in patients with significant arrhythmias, and coronary vasodilators are best avoided in those with significant bronchospasm.

Preoperative Invasive Cardiac Testing for Risk Stratification

Recommendations for perioperative coronary angiography are similar to those for patients with suspected or known CAD in general and should conform to the ACC/AHA guidelines for coronary angiography. This procedure should be considered for patients who are at high risk for adverse outcomes based on the presence of unstable angina, angina refractory to medical treatment, high-risk results on noninvasive testing, or a nondiagnostic test in a high-risk patient undergoing high-risk noncardiac surgery. It should be considered on an individual basis for those with extensive ischemia revealed during noninvasive testing, for those at intermediate risk undergoing high-risk surgery for whom test results are nondiagnostic, for those convalescing from MI who require urgent noncardiac surgery, and for those with perioperative MI. In patients who have a high clinical risk (RCRI >3) and high-risk features on noninvasive cardiac testing, diagnostic cardiac catheterization should be considered (see Fig. 24-1).

PREOPERATIVE RISK MODIFICATION TO REDUCE PERIOPERATIVE CARDIAC RISK

Coronary Revascularization

Retrospective analyses of the Coronary Artery Surgery Study (CASS) registry and the Bypass Angioplasty Revascularization Investigation (BARI), along with prospective study of patients enrolled in the Coronary Artery Revascularization Prophylaxis (CARP) trial, have shown that prophylactic coronary revascularization with either coronary artery bypass grafting (CABG) or percutaneous coronary intervention (PCI) provides no short-term or mid-term benefit for patients without left main disease or multivessel CAD in the presence of poor left ventricular systolic function. Although high-risk patients who have successfully undergone PCI or CABG before elective noncardiac surgery do experience fewer adverse perioperative cardiovascular events compared with similar patients treated with medications alone, the mortality and morbidity associated with PCI or CABG appear to offset the potential benefit of coronary revascularization before any high-risk cardiac surgery (e.g., major vascular surgery). Therefore, evidence is lacking to support elective coronary revascularization as a primary strategy for perioperative risk reduction in intermediate-risk patients undergoing major noncardiac surgery.