

Table 9. Predictive Value of Preoperative ST-Segment Changes Detected by Ambulatory Monitoring for Perioperative Myocardial Infarction and Cardiac Death After Major Vascular Surgery

Author	n	Patients With		Perioperative Events		Event	Comments
		Abnormal Test (%)	Criteria for Abnormal Test	Positive* Test	Negative Value		
Raby 1989 (51)	176	18	A	10% (3/32)	1% (1/144)	D,M	24 to 48 h during ambulation
Pasternack 1989 (162)	200	39	A	9% (7/78)	2% (2/122)	D,M	
Mangano 1990 (19)	144	18	A,B	4% (1/26)	4% (5/118)	D,M	Immediately preoperatively
Fleisher 1992 (158)	67	24	A,B	13% (2/16)	4% (2/51)	D,M	Immediately preoperatively
McPhail 1993 (160)	100	34	A	15% (5/34)	6% (4/66)	D,M	
Kirwin 1993 (159)	96	9	A	11% (1/9)	16% (14/87)	D,M	Definition of MI based on enzymes only
Fleisher 1995 (163)	86	23	A,B	10% (2/20)	3% (2/66)	D,M	Quantitative monitoring not predictive

A indicates greater than or equal to 1 mm ST-segment depression; B, greater than or equal to 2 mm ST-segment elevation; D, death; MI, myocardial infarction.

*Positive predictive value for postoperative cardiac events.

a series of more than 250 patients studied in this circumstance, a single patient developed subacute aneurysm rupture 12 hours after testing and was successfully repaired (291). In patients with important abnormalities on their resting ECG (e.g., left bundle-branch block, left ventricular hypertrophy with “strain” pattern, or digitalis effect), other techniques such as exercise echocardiography or exercise myocardial perfusion imaging should be considered. The sensitivity and specificity of exercise thallium scans in the presence of left bundle-branch block are reported to be 78% and 33%, respectively, and overall diagnostic accuracy varies from 36% to 60% (152,153). In contrast, the use of vasodilators in such patients has a sensitivity of 98%, a specificity of 84%, and a diagnostic accuracy of 88% to 92% (154-156). Exercise should not be combined with dipyridamole in such patients, and synthetic catecholamines can also yield false-positive results (157).

In patients unable to perform adequate exercise, a nonexercise stress test should be used. In this regard, dipyridamole myocardial perfusion imaging testing and dobutamine echocardiography are the most common tests. Intravenous dipyridamole should be avoided in patients with significant bronchospasm, critical carotid disease, or a condition that prevents their being withdrawn from theophylline preparations. Dobutamine should not be used as a stressor in patients with serious arrhythmias or severe hypertension or hypotension. For patients in whom echocardiographic image quality is likely to be poor, a myocardial perfusion study is more appropriate. Soft tissue attenuation can also be a problem with myocardial perfusion imaging. If there is an additional question about valvular dysfunction, the echocardiographic stress test is favored. In many instances, either stress perfusion or stress echocardiography is appropriate. In a meta-analysis of dobutamine stress echocardiography, ambulatory electrocardiography, radionuclide ventriculography, and dipyridamole thallium scanning in predicting adverse cardiac outcome after vascular surgery, all tests had a similar predictive value, with overlapping confidence intervals (164). The expertise of the local laboratory in identifying advanced coronary disease is probably more important than the partic-

ular type of test. Fig. 3 illustrates an algorithm to help the clinician choose the most appropriate stress test in those various situations.

Currently the use of ambulatory electrocardiography as a preoperative test should be restricted to identifying patients for whom additional surveillance or medical intervention might be beneficial. The current evidence does not support the use of ambulatory electrocardiography as the only diagnostic test to refer patients for coronary angiography.

For certain patients at high risk, it may be appropriate to proceed with coronary angiography rather than perform a noninvasive test. For example, preoperative consultation may identify patients with unstable angina or evidence for residual ischemia after recent MI for whom coronary angiography is indicated. In general, indications for preoperative coronary angiography are similar to those identified for the nonoperative setting. The following recommendations provide a summary of indications for preoperative coronary angiography in patients being evaluated before noncardiac surgery. These are adapted from the ACC/AHA guidelines for coronary angiography published in 1999 (292).

Recommendations for Coronary Angiography in Perioperative Evaluation Before (or After) Noncardiac Surgery

Class I: Patients With Suspected or Known CAD

1. Evidence for high risk of adverse outcome based on noninvasive test results.
2. Angina unresponsive to adequate medical therapy.
3. Unstable angina, particularly when facing intermediate-risk* or high-risk* noncardiac surgery.
4. Equivocal noninvasive test results in patients at high-clinical risk† undergoing high-risk* surgery.

Class IIa

1. Multiple markers of intermediate clinical risk† and planned vascular surgery (noninvasive testing should be considered first).