

## Q: Should exercise electrocardiography be a routine part of the periodic health physical?

### ANIL JAIN, MD

Department of General Internal Medicine, The Cleveland Clinic

### RICHARD LANG, MD

Head, Section of Preventive Medicine; Chairman, Department of General Internal Medicine, The Cleveland Clinic

**A:** No. Routine exercise electrocardiography (ECG) is not recommended in patients who have no signs or symptoms of coronary artery disease. Exercise ECG is notoriously ineffective at predicting underlying coronary artery disease, and a positive exercise ECG test in an apparently healthy patient is not known to have any association with cardiovascular morbidity and mortality.

Exercise ECG is warranted, however, in patients with multiple cardiovascular risk factors if coronary artery disease is suspected.

### ■ LIMITATIONS OF ECG

Ischemic heart disease is the leading cause of death, and coronary atherosclerosis is most often the cause. Moreover, 1 to 2 million middle-aged US men have “silent” myocardial ischemia—ie, asymptomatic but physiologically significant coronary disease.<sup>1</sup>

Unfortunately, exercise ECG is not helpful in detecting silent ischemia or in identifying people at risk for coronary disease. Its limitations as a screening test are many:

**False-negative rates are high.** Most patients with silent myocardial ischemia have a false-negative (ie, normal) result on exercise ECG,<sup>2</sup> so the test fails to identify patients at highest risk for myocardial infarction or sudden cardiac death.<sup>3,4</sup>

**A true-positive result may not be significant.** Patients with a positive (abnormal) test often develop angina pectoris as their initial coronary event, not sudden death or myocardial infarction,<sup>5</sup> thus reducing the importance of a true-positive test result.

**False-positive results are common.** In two studies,<sup>6,7</sup> 89% to 99% of apparently healthy people with an abnormal exercise ECG had no underlying coronary artery disease when followed for 4 to 13 years.<sup>6,7</sup> False-positive tests usually lead to additional testing for coronary artery disease: these tests are invasive and expensive and cause the patient unnecessary anxiety.

**Sensitivity and specificity rates vary widely.** The average reported sensitivity of exercise ECG is 68% (range 23%–100%); the average reported specificity is 77% (range 17%–100%).<sup>8</sup> However, recent data suggest that, among patients seen by family physicians and general internists, the average sensitivity is lower and the average specificity is higher.<sup>9,10</sup>

### Attempts to improve exercise ECG

In recent years, attempts to improve the sensitivity and specificity of exercise ECG include the use of the maximal exercise test,<sup>11</sup> the incorporation of right-sided precordial leads,<sup>12</sup> and normalization of ST-segment depression for R-wave magnitude.<sup>13</sup> Despite these improvements, the usefulness of the test as a screening tool remains limited because of the very low, 1% *absolute* risk of coronary events in patients with a positive test.

The treadmill stress test has generally become safer over time. Older studies reported complications (myocardial infarction, death) at a rate of 3.4 to 8.9 per 10,000 tests,<sup>14,15</sup> whereas newer studies report event rates of 0.8 to 2.4 per 10,000.<sup>16,17</sup>

### ■ RECOMMENDATIONS

Practice guidelines agree that exercise ECG is not routinely warranted in apparently healthy people.<sup>18–23</sup> The US Preventive Services Task Force (USPSTF)<sup>6</sup> and the American College

**Exercise ECG usually does not detect silent ischemia**



of Cardiology/American Heart Association (ACC/AHA) Task Force Practice Guidelines<sup>18</sup> concluded that there is a lack of evidence to recommend it for screening patients with no symptoms of coronary artery disease. The American College of Physicians–American Society of Internal Medicine (ACP-ASIM) and American Academy of Family Physicians (AAFP) also do not advocate routine exercise ECG in apparently healthy people. The AAFP does not include recommendations for routine exercise ECG in its most recent age charts for the periodic health examination.<sup>19</sup> The ACP-ASIM defers to the USPSTF recommendations.<sup>18</sup>

### Who should undergo the test?

Routine screening with exercise ECG is not recommended as part of the periodic health examination or the preparticipation sports examination for children, adolescents, or young adults.<sup>6</sup> However, it is recommended in people in whom impaired function could affect public safety and in certain patients

prior to an exercise program. It also should be considered in patients with dyspnea on exertion or chest discomfort, with abnormal resting electrocardiograms (eg, complete right bundle branch block or < 1 mm of resting ST depression),<sup>18</sup> or with multiple risk factors for atherosclerosis (male gender, old age, hypertension, hyperlipidemia, diabetes mellitus, smoking, family history, low high-density lipoprotein cholesterol levels, obesity), in whom the likelihood for cardiovascular disease is intermediate (10%–90%).

### Emphasis on prevention, not screening

All major organizations conclude that, rather than *screen* for coronary disease in apparently healthy people, physicians should emphasize aggressive primary prevention of cardiovascular disease by identifying and treating the known modifiable cardiovascular risk factors: diabetes mellitus, hyperlipidemia, hypertension, tobacco use, and obesity. Because of the limitations of exercise ECG in identifying patients at risk, the search for a better screening test continues.

### REFERENCES

- Cohn PF. Silent myocardial ischemia. *Ann Intern Med* 1988; 109:312–317.
- Weiner DA. Screening for latent coronary artery disease by exercise testing [letter]. *Circulation* 1991; 83:1104–1106.
- Coplan NL, Fuster V. Limitations of the exercise test as a screen for acute cardiac events in asymptomatic patients. *Am Heart J* 1990; 119:987–990.
- Epstein SE, Quyyumi AA, Bonow RO. Sudden cardiac death without warning. Possible mechanisms and implications for screening asymptomatic populations. *N Engl J Med* 1989; 321:320–324.
- McHenry PL, O'Donnell J, Morris SN, Jordan JJ. The abnormal exercise electrocardiogram in apparently healthy men: a predictor of angina pectoris as an initial coronary event during long-term follow-up. *Circulation* 1984; 70:547–551.
- Screening for asymptomatic coronary artery disease. In: Guide to clinical preventive services, US Preventive Services Task Force. Washington, DC: US Department of Health and Human Services, 1996:3–14.
- Detrano R, Froelicher V. A logical approach to screening for coronary artery disease. *Ann Intern Med* 1987; 106:846–852.
- Gianrossi R, Detrano R, Mulvihill D, et al. Exercise-induced ST depression in the diagnosis of coronary artery disease. A meta-analysis. *Circulation* 1989; 80:87–98.
- Froelicher VF, Lehmann KG, Thomas R, et al. The electrocardiographic exercise test in a population with reduced workup bias: diagnostic performance, computerized interpretation, and multivariable prediction. *Ann Intern Med* 1998; 128:965–974.
- Morise AP, Diamond GA. Comparison of the sensitivity and specificity of exercise electrocardiography in biased and unbiased populations of men and women. *Am Heart J* 1995; 130:741–747.
- Gibbons LW, Mitchell TL, Wei M, Blair SN, Cooper KH. Maximal exercise test as a predictor of risk for mortality from coronary heart disease in asymptomatic men. *Am J Cardiol* 2000; 86:53–58.
- Michaelides AP, Psomadaki ZD, Dilaveris PE, et al. Improved detection of coronary artery disease by exercise electrocardiography with the use of right precordial leads. *N Engl J Med* 1999; 340:340–345.
- Cheng SL, Ellestad MH, Selvester RH. Significance of ST-segment depression with R-wave amplitude decrease on exercise testing. *Am J Cardiol* 1999; 83:955–959.
- Stuart RJ Jr, Ellestad MH. National survey of exercise stress testing facilities. *Chest* 1980; 77:94–97.
- Rochmis P, Blackburn H. Exercise tests. A survey of procedures, safety, and litigation experience in approximately 170,000 tests. *JAMA* 1971; 217:1061–1066.
- Gibbons L, Blair SN, Kohl HW, Cooper K. The safety of maximal exercise testing. *Circulation* 1989; 80:846–852.
- Franklin BA, Gordon S, Timmis GC, O'Neill WW. Is direct physician supervision of exercise stress testing routinely necessary? *Chest* 1997; 111:262–265.
- Gibbons RJ, Balady GJ, Beasley JW, et al. ACC/AHA guidelines for exercise testing. *J Am Coll Cardiol* 1997; 30:260–311.
- American Diabetes Association Clinical Practice Recommendations 2001. *Diabetes Care* 2001; 24(suppl 1):S1–S133.
- American College of Cardiology. ACP/AHA Practice Guidelines. [www.acc.org/clinical/progress/progress.htm](http://www.acc.org/clinical/progress/progress.htm). Accessed 3/13/2002.
- ACC/AHA panel prepares guidelines for exercise testing. *Am Fam Physician* 1998; 57:563–565.
- American Academy of Family Practice. Summary of policy recommendations for periodic health examinations. [www.aafp.org/exam](http://www.aafp.org/exam). Accessed 3/13/2002.
- ACP-ASIM Scientific Policy Department. ACP-ASIM Online, Scientific Policy, Guidelines. [www.acponline.org/sci-policy/guidelines](http://www.acponline.org/sci-policy/guidelines). Accessed 3/13/2002.

ADDRESS: Anil Jain, MD, Department of General Internal Medicine, A91, The Cleveland Clinic Foundation, 9500 Euclid Avenue, Cleveland, OH 44195.

False-positive results lead to expensive and invasive testing