Should the exercise ECG be used to screen for sudden cardiac death?

James Freeman¹, Euan A. Ashley¹,², and Victor Froelicher¹,³*

¹Division of Cardiovascular Medicine, Department of Medicine, Stanford University School of Medicine, Stanford, CA 94305, USA; ²Stanford Hypertrophic Cardiomyopathy Center, Stanford Hospitals and Clinics, Stanford, CA 94305, USA; and ³Department of Cardiology, Veterans Affairs Palo Alto Health Care System, Palo Alto, CA 94304, USA

Online publish-ahead-of-print 5 February 2009

This editorial refers to ‘Asymptomatic ST-segment depression during exercise testing and the risk of sudden cardiac death in middle-aged men: a population-based follow-up study’¹, by J.A. Laukkanen on page 558

Unfortunately no randomized controlled trials have been performed to demonstrate that screening asymptomatic adults without known cardiovascular disease leads to improved outcomes. All that is available are observational studies to guide our efforts to screen and treat asymptomatic patients in an effort to minimize the risks of coronary heart disease (CHD) and sudden cardiac death (SCD). The findings of Laukkanen et al.¹ make a unique contribution to the literature in that they demonstrate the ability of the exercise ECG to predict SCD rather than just cardiac death. It is well established that the exercise ECG test can prognosticate CHD death. Using angiography as an endpoint, meta-analysis has suggested a mean sensitivity of 68% (range 23–100%) and a mean specificity of 77% (range 17–100%) for the exercise ECG.² The only angiographic study designed to limit work-up bias has demonstrated more realistic test characteristics with a sensitivity of 45% and a specificity of 85%.³ A similar analysis in asymptomatic adults has demonstrated similar test characteristics. The study by Laukkanen and colleagues specifically evaluates the ability of the exercise ECG test to predict SCD in asymptomatic patients, and had a sensitivity of 18% and a specificity of 90% for exercise ST depression, and a sensitivity of 11% and specificity of 97% for recovery ST depression.⁴ These test characteristics are not surprising but confirm the limitations of the test as a screening modality in the general population.

The authors extend their observations to their subjects with cardiac risk factors. It is well known that the predictive value of the exercise ECG test for CHD death is markedly better in subjects with cardiac risk factors.⁴–⁶ Gibbons et al. demonstrated an age-adjusted relative risk of an abnormal exercise test for CHD death of 21 in those with no risk factors, 27 in those with one risk factor, 54 in those with two risk factors, and 80 in those with ≥3 factors. Similarly, Laukkanen and colleagues previously demonstrated that ST depression during exercise and in recovery was associated with an increased relative risk of CHD mortality of 5.9 in smokers, 3.8 in hypercholesterolaemic men, and 4.7 in hypertensive men adjusting for other risk factors. Several studies have evaluated the predictive potential of exercise testing diabetics with symptoms or known CHD and have demonstrated that the prognostic performance of the test is similar or better than exercise testing in non-diabetics.⁷–⁹ Lyerly et al. performed exercise ECG testing in 2854 asymptomatic diabetic men without known CHD. They demonstrated that across normal, equivocal, and abnormal ECG groups, and after adjustment for standard cardiac risk factors, the hazard ratios for CHD mortality were 1, 1.7, and 2.2, respectively [P(trend) < 0.001].¹⁰ Thus, the ability of exercise ECG testing to predict CHD death in asymptomatic healthy men with cardiac risk factors has been well demonstrated. Laukkanen et al. build on these findings and demonstrate the ability of this test to predict specifically SCD in asymptomatic patients with multiple cardiac risk factors.

As the authors point out, the utility of a screening test is a function of both the test performance and the ability to intervene successfully in a patient with a positive test to improve outcomes. Several studies have demonstrated a decrease in morbidity and mortality using medical and surgical intervention in minimally symptomatic patients with asymptomatic episodes of ST depression on exercise ECG. The Atenolol Silent Ischemia Study (ASIST) was a multicentre, randomized, double-blind, placebo-controlled study that evaluated 306 outpatients with mild angina, abnormal exercise tests, and ischaemia on ambulatory monitoring who were randomized to receive either atenolol (100 mg/day) or placebo.¹¹ Survival, free of major cardiovascular events, improved in the atenolol-treated patients. The Asymptomatic Cardiac Ischemia Pilot (ACIP) study randomized 558 patients with coronary anatomy amenable to revascularization with ECG-demonstrated ischaemia.¹² At 1 year, the mortality rate was 4.4% in the angina-guided group (eight of 183), 1.6% in...
the ischaemia-guided group (three of 183), and none in those randomized to revascularization.

While these two studies suggest that modern therapies for patients with cardiovascular symptoms and ECG-documented ischaemia improve outcomes, it is difficult to generalize these findings to a completely asymptomatic population. In addition, it is unknown if a similar impact on SCD in particular could be achieved with these interventions.

Thus, while Laukkanen et al. have clearly demonstrated the predictive capability of the exercise ECG for sudden cardiac death, particularly in those with cardiac risk factors, the low sensitivity of the test continues to limit its value. Furthermore, it is very difficult to know at this point if there is any intervention available that can specifically prevent or delay SCD. Future studies will hopefully clarify these issues.

Conflict of interest: none declared.

References