Is exercise treadmill testing useful for detecting heart disease in women?

■ EVIDENCE-BASED ANSWER

Exercise treadmill testing has a sensitivity of 70% and specificity of 61% for the detection of coronary artery disease (CAD) in women (strength of recommendation [SOR]: **A**, based on a meta-analysis). It is useful for detecting CAD in symptomatic women who have an intermediate risk as determined by age and symptoms (SOR: **C**, based on expert opinion). Exercise treadmill testing may also have an application in determining exercise capacity and potential as a tool to predict cardiovascular death in women (SOR: **A**, cohort study).

■ EVIDENCE-BASED SUMMARY

Few studies of exercise treadmill testing include a significant number of women, which makes it difficult to ascertain its value for detecting CAD in women. A large meta-analysis of 19 studies looked specifically at women (n=3721) and found that noninvasive exercise tests only "moderately useful" for the detection of CAD. Exercise treadmill testing in women had a specificity of 0.70 (95% confidence interval [CI], 0.64–0.75), a sensitivity of 0.61 (95% CI, 0.54–0.68), a positive likelihood ratio of 2.25 (95% CI, 1.84–2.66) and a negative likelihood ratio of 0.55 (95% CI, 0.47–0.62). In comparison, exercise treadmill testing in men had a sensitivity of 0.70 and a specificity of 0.77.[1] The **Table** demonstrates how exercise treadmill testing performs for different levels of pretest probability.

Among the theoretical reasons for the diminished accuracy of the exercise treadmill testing in women are the varying catecholamine response to exercise, a higher incidence of mitral valve prolapse, and chest wall anatomy different than that in men.[1] Also, the methods used in performing exercise treadmill testing, as well as the thresholds for an abnormal test result, were established for men. Accuracy may also be affected by the subjectivity inherent in the performance and interpretation of the exercise treadmill testing, in particular, the reading of the ST segment.[2]

A large cohort study of 2994 asymptomatic women found that those women with a below-average peak exercise capacity and heart-rate recovery rate were 3.5 times more likely to die of cardiovascular causes than women who were above average (95% CI, 1.57–7.86).[3] Another cohort study of 5721 women found that an exercise capacity of <5 metabolic equivalents (METS) tripled the risk of death as compared with those with an exercise capacity of >8 METS.[4] These studies support the role of exercise treadmill testing for risk stratification for CAD disease in women.

■ RECOMMENDATIONS FROM OTHERS

The Institute for Clinical Systems Improvement states that exercise treadmill testing has application for the detection of coronary artery disease in those women with an intermediate (10%–90%) pretest probability of coronary artery disease as determined by age, gender, and symptoms. The intermediate category includes women aged 30 to 49 years with typical symptoms of angina, women aged 50 to 59 years with typical or atypical symptoms of angina, and women aged 60 to 69 years with atypical or nonanginal chest pain. All other women fall into groups with pretest probability either high enough or low enough that the exercise treadmill testing is less useful.[5]

The American College of Cardiology (ACC) and the American Heart Association concluded that the diagnosis of CAD in women presents difficulties not experienced with men, due primarily to the lower sensitivity and specificity of exercise treadmill testing. The ACC recommends exercise treadmill testing for the diagnosis of CAD in patients with an intermediate pretest probability of coronary disease based on

Post-test probabilities of coronary artery disease using exercise echocardiogram

Pretest symptoms/ probability of CAD	Post-test probability of CAD	
	Positive test (%)	Negative test (%)
Definite angina— 71% probability	85	57
Probable angina— 31% probability	50	20
Nonspecific chest pain— 6% probability	13	3

CAD, coronary artery disease.
Table adapted from Kwok et al 1999.[1]

age, gender, and symptoms. (This recommendation is described as one for which there is evidence or general agreement that a given procedure or treatment is useful and effective.)[6]

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■ CLINICAL COMMENTARY

False-positive rate and costs may argue for stress radionuclide or echocardiogram

The relative lack of evidence regarding the diagnostic accuracy of exercise treadmill testing in women is frustrating given the prevalence of both CAD and symptoms of chest pain in women. Nevertheless, it seems clear that the false-positive rate and costs argue that unless a woman meets specific criteria (eg, International Sensitivity Index recommendations), stress radionuclide or stress echocardiogram are better initial tests. I will use exercise treadmill testing when evaluating exercise capacity in my women patients.

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