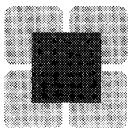

WILLIAM S. WILKE, MD, EDITOR

# CONTEMPORARY CONSIDERATIONS IN EXERCISE ECG TESTING

Exercise electrocardiography (ECG), a valuable mode of cardiologic testing for nearly 40 years, continues to hold its own as a diagnostic technique. Its applications are diversifying, and its use continues to increase, especially among internists, despite the promises of newer technologies.

## INDICATIONS

Exercise testing has three major applications: as a diagnostic study to attempt confirmation or denial of the diagnosis of coronary heart disease; as a means to assess the extent of myocardial ischemia; and as a test of functional capacity in those with established disease.

Evaluating symptoms remains the most common indication for diagnostic exercise ECG, although the history of chest pain provides excellent pretest stratification. If a male over the age of 40 has nonspecific chest pain atypical of ischemia, there is a 10% likelihood that angiography will show significant obstructive disease. If the patient's story is typical, except for one or two features, the risk jumps to 65%, and if the history is classical, to 85%. An abnormal exercise test by ECG criteria increases the posttest risk by only 6% to 20%. On the other hand, in an individual with typical angina, an abnormal exercise test adds little to the diagnosis.

The most important indication for exercise testing currently is for the stratification of risk for subsequent future ischemic events. Tests are now recommended early prior to discharge after acute myocardial infarction. They are important after revascularization by angioplasty or bypass to document the presence of residual ischemia. Exercise ECG provides the essential data for calculating an exercise prescription, and it is used to determine the extent of disability, an area of growing opportunity for internists.

At The Cleveland Clinic Foundation, where 750 to 800 valve operations are performed each year, exercise testing is being used more than ever before to evaluate valve dysfunction, particularly when it is difficult to decide whether or not to operate at a given time.

Exercise testing is also frequently used to evaluate implanted high-technology devices such as pacemakers and cardioverter-defibrillators.

## SCREENING

Reasonable approaches to exercise ECG screening for coronary disease have been described, and refinements in Bayesian methods have led to reports of improved diagnostic ability. Recent reports have suggested that screening exercise tests may be justified in patients with one clinical risk factor or a total cholesterol/HDL cholesterol ratio of 6.0 or greater, though others report such a small predictive value for an abnormal test in hypercholesterolemic individuals that the effort seems hardly worthwhile.

## CONTRAINDICATIONS

Good clinical judgment should be foremost in deciding the contraindications for exercise ECG. Whereas absolute contraindications are definitive, in selected cases with relative contraindications exercise testing can provide valuable information, even when performed submaximally. At the Cleveland Clinic, we have noticed in recent years a significant increase in the number of individuals undergoing testing for evaluation of therapeutic devices or procedures where former contraindications have been set aside.

Exercise testing is contraindicated in unstable postinfarction patients, with the emphasis on "unstable," since we're testing more and more patients with non-Q-wave infarcts very early. It is also contraindicated in the presence of acute myocarditis or pericarditis; very unstable hemodynamic function; dissecting aortic aneurysm; hemodynamically unstable arrhythmia; and very severe aortic stenosis. In some milder cases of aortic stenosis, exercise testing is done, particularly in conjunction with simultaneous echocardiography to see what happens to the gradient; however, in severe cases extreme caution is a must.

## EXERCISE TESTING: PRESENT AND FUTURE

Exercise testing is very accessible, and it is quite cost-effective, particularly where there is no need to couple it with any of the noninvasive, high-technology diagnostic

techniques. But exercise testing also serves as the doorway to these and other more powerful studies for coronary disease, including cardiac catheterization. It is very important for informing about prognosis for medical and psychosocial purposes, and it provides a reasonable and objective means of follow-up, particularly in patients who don't provide an excellent history or don't know how far or how long they're walking.

In summary, exercise testing is not the most sensitive noninvasive test for the diagnosis of chest pain, but its reliability and cost-effectiveness for monitoring the progression of disease and determining therapeutic efficacy are unmatched by other diagnostic means. In the United States, the volume of exercise tests being performed is increasing. The Health Care Financing Administration reports a 22% increase in the number of exercise tests interpreted and reported from 1986 to 1988. This represents an estimated increased annual cost of about $30 million. With the test's increasing use and its role as a means of access to more expensive noninvasive and invasive procedures, improvements in the recognition of its indications for performance can have a huge impact on health care.

FREDRIC J. PASHKOW, MD
Medical Director
Cardiac Health Improvement and Rehabilitation
The Cleveland Clinic Foundation

### SUGGESTED READING

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## TRENDS IN NONCARDIAC CHEST PAIN

Up to 30% of patients referred for cardiac catheterization every year are found to have normal coronary arteries. Of these, up to 50% may have esophageal abnormalities. Although the prognosis for these patients is excellent, their functional outcome is generally poor. Even with appropriate treatment, many of these patients continue to have chest pain which they believe has a cardiac source. The result is costly in terms of quality of life and lost work.

### ESOPHAGEAL CAUSES RECONSIDERED

Until recently it was believed that most esophageal chest pain resulted from motor disorders. However, the association has been difficult to prove in controlled settings; patients rarely have chest pain at the time of manometry, even if a motor abnormality is present. Even 24-hour manometry has failed to show a clear association between pain and motor abnormalities. Increasingly, both the "nutcracker" esophagus (characterized by high-amplitude, long-duration peristaltic contractions) and nonspecific motor disorders are viewed as manometric epiphenomena.

In the 1990s, the pendulum has swung to gastroesophageal reflux disease (GERD) as the predominant esophageal cause of chest pain. Studies have demonstrated that pain is reproduced more frequently in the setting of lowered pH (15% to 33%) than with abnormal motor events.

### DIAGNOSTIC STRATEGY

The American Gastroenterology Association has issued guidelines for the management of esophageal chest pain. The first, crucial step is to exclude heart disease with stress testing, cardiac catheterization, or both. Musculoskeletal causes can be excluded on physical examination.

Second, structural gastrointestinal disease should be ruled out with a barium esophagram or upper endoscopy. If these are negative, then diagnosis of GERD should be attempted, preferably with 24-hour pH monitoring. Although expensive, 24-hour pH monitoring will determine the extent of reflux in upright, supine, and combined positions, and it will correlate reflux with chest pain.

A less expensive option is the Bernstein test. This relatively simple procedure involves reproducing heartburn or chest pain by perfusing the esophagus with hydrochloric acid. However, the yield is low, ranging in various studies from 6% to 36%. The Bernstein test is helpful if the results are positive, but not if they are negative.

If reflux cannot be identified, then specialized testing is indicated to rule out motor disorders and altered pain perception. This includes esophageal manometry,

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