Introduction to the New Department, Exercise and the Heart

Recent advances have clarified three of the applications of exercise testing: exercise testing in patients after myocardial infarction, screening, and for predicting disease severity. In regard to post-MI exercise testing, there are numerous clinical reasons for performing the test. However, its prognostic value is not as straightforward as once thought. Algorithms have been published based on various exercise test responses, particularly ST depression, recommending that patients with such responses have coronary angiography and be considered for interventions. The recent American College of Cardiology position paper on exercise testing clearly states that ST-segment depression is the most important predictor postinfarction. However, a careful review of the 24 available follow-up studies using a new technique called meta-analysis demonstrates that only an abnormal blood pressure response and a decreased exercise capacity occurred more frequently than by chance as significant risk predictors in these studies. This means that the other responses clearly do not identify an increased risk group and algorithms based on the results of selected studies should be strongly reconsidered.

A factor not considered in these studies, however, is the severity of the response (that is, the amount of ST depression). Also, it appears that exercise test responses mean different things in subsets of post-myocardial infarction patients. Exercise studies using thallium scintigraphy have demonstrated that in patients with large anterior infarcts, ST-segment shifts can be quite marked, but not at all related to ischemia. However, ST-segment depression clearly seems to be related to ischemia in patients with initial inferior wall infarcts and in non Q-wave infarcts. ST-segment elevation over diagnostic Q-waves appears to identify a group with more severe ventricular dysfunction, but does not necessarily mean ischemia.

Screening

Recent studies markedly change the understanding of the application of exercise testing as a screening tool. These studies include four follow-up studies using hard endpoints,7 and one study from the CASS population. The CASS study was based on 195 individuals with abnormal exercise test results by ST-segment criteria, and normal coronary angiograms who were followed for seven years.6 In this latter study, no increased incidence of cardiac events was found. The concerns raised by the findings of Ericksson et al7 that such individuals were still at increased risk even with normal angiograms was not substantiated. The other new follow-up studies (MRFIT, Seattle Heart Watch, Indiana State Police, Lipid Research Clinic) had quite different results from prior studies, because hard cardiac endpoints rather than angina were required criteria. Most of the prior studies included angina as an endpoint in the incidence of coronary heart disease. This led to a bias for individuals with abnormal test results who subsequently report chest pain to be diagnosed as having angina. When only hard endpoints (death or MI) were used, the results are very discouraging. ST-segment depression could identify only one third of the patients who later developed hard events, and 95 percent of abnormal responders were false positive; that is, they did not die or have a myocardial infarction. This contrasts with a 60 percent sensitivity and 25 percent predictive value shown in the earlier studies.

Prognostication

Lee, Cook and Goldman6 have developed a strategy to identify patients with left main coronary artery disease (LMCAD). It is a simple model that predicts the probability of LMCD from a combination of clinical and exercise test variables and can be applied using a pocket calculator or graphs published in their paper. The model was derived from multivariate analysis of already published data obtained clinically without exercise testing and then from exercise test variables. They found that the model using only three variables (age, angina, amount of ST depression) provided reasonably accurate estimates of the prevalence of left main coronary artery disease in subsets of patients.

The key question in trying to identify high-risk coronary artery disease is: can those who are recog-


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nized have improved survival if they undergo coronary artery bypass surgery? In order to answer this question, Weiner and the CASS group compared the survival of patients who underwent bypass surgery to those who received medical therapy in 5,303 non-randomized patients from the CASS registry. Patients were stratified into subsets according to the results of exercise testing. Surgical benefit was greatest in the 789 patients who exhibited at least 0.1 mvolt of ST-segment depression and who could exercise only 5 METs or less. Among the 398 patients with three-vessel disease showing these characteristics, seven-year survival was 58 percent for the medical group and 81 percent for the surgical group. There was no difference in survival between the surgical and medical groups among the 1,545 patients without ischemic ST-segment depression who were able to exercise 9 METs or more.

Other areas of recent advancement are the confirmation of early investigators that ST-segment depression does not localize lesions. It appears to be a global subendocardial phenomenon. The clinical observation that ST-segment depression in the inferior leads is most often false positive due to atrial repolarization needs to be confirmed. Recent work has also clarified some of the understanding of chronotropic incompetence or heart rate impairment. Clearly, patients who have a limited heart rate in response to exercise have a poorer prognosis. However, the reason for their heart rate limitation needs to be specified. It could be due either to ischemia or to cardiac dysfunction. Other possibilities are a normal variant or conduction system disease. Unfortunately, prior studies have not specified the etiology.

Position Papers

Important recent publications which should be considered by individuals working in clinical exercise physiology include the recent report of the ACC/AHA task force on assessment of cardiovascular procedures that specifically covered guidelines for exercise testing. The other important publication is the ACC position report on cardiac rehabilitation. In a very organized fashion, this report defines the goals of cardiovascular services. It also outlines strategies for achieving the goals including: timing of entry, entry criteria, and content and duration. Acknowledging that a major expense of programs is supervised ECG monitoring, criteria for ECG monitoring are given.

The report specifies that in the event patients with the following conditions are selected for an exercise program, ECG monitoring should be included:

a. Severely depressed left ventricular function (ejection fraction under 30).

b. Resting complex ventricular arrhythmia (Lown type 4 or 5).

c. Ventricular arrhythmias appearing or increasing with exercise.

d. Decrease in systolic blood pressure with exercise.

e. Survivors of sudden cardiac death.

f. Patients following myocardial infarction complicated by congestive heart failure, cardiogenic shock, and/or serious ventricular arrhythmias.

g. Patients with severe coronary artery disease and marked exercise-induced ischemia.

h. Inability to self-monitor heart rate due to physical or intellectual impairment if this is medically necessary.

These documents are updates of previous position statements and are extremely important with cost containment high priority.

Responses to this editorial and to subsequent publications also will be considered for publication in this new department (see page 584).

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