exercise and the heart

Prognostic Value of Bicycle Ergometry in Medically Treated Patients with Three-vessel Coronary Artery Disease*

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Patients with three-vessel coronary artery disease and stable angina assigned to coronary bypass surgery had an improved survival in the European Coronary Surgery Study.¹ In the Coronary Artery Surgery Study² and in the Veterans Administration Cooperative Study,³ improved survival in the surgical group was confirmed only in patients with three-vessel disease accompanied by impaired left ventricular function. Exercise testing has had prognostic significance in other studies, and the objective evidence of ischemia during exercise identifies a subgroup of patients with three-vessel disease at increased risk of dying during medical therapy.⁴⁶

CASE REPORT

The patient is a 35-year-old man who was admitted to a local hospital for complaints of prolonged chest pain in July 1983. The ECG changes were consistent with acute inferior myocardial infarction, and the patient was treated with IV streptokinase. No enzyme elevation was observed, and the ST segment elevation in leads 2, 3, and aVF disappeared after streptokinase treatment and only negative T waves were seen in leads V₆ and V₉.

During the first day, the patient had recurrent chest pains with ST segment elevation in the same leads and was successfully resuscitated from ventricular fibrillation. The patient was treated with amiodarone (400 mg daily) and nitrates and immediately was transferred to our institute for cardiac catheterization and coronary arteriography. During the catheterization, normal right heart pressures and an elevated left ventricular end-diastolic pressure (LVEDP) was measured. Ventriculography revealed posterobasal hypokinesis and an ejection fraction of 40 percent. There was a 50 percent luminal diameter stenosis of the left anterior descending coronary artery, a subtotal occlusion of the circumflex artery, and greater than 50 percent stenosis of the right coronary artery. The predischarge Holter monitoring was normal.

One month later, the patient was readmitted to be evaluated for revascularization surgery. He was symptom-free and completed a bicycle exercise test up to 175 W, with a heart rate of 145 beats/min, and blood pressure of 220/110 mm Hg, and no signs or symptoms of ischemia. Because of his lack of symptoms and normal exercise test results, medical therapy was continued, and he was followed up regularly.

The follow-up was uneventful, and in 1987 the patient was admitted for a reevaluation. After discontinuation of medications for three weeks, an exercise test, exercise thallium scintigraphy, and 48-hour Holter monitoring were done. All of the test results were normal. There was some progression on the coronary arteriogram only in the right coronary artery. During programmed electrical stimulation, no ventricular tachycardia or ventricular fibrillation were induced from the right ventricle. The patient was discharged from the hospital without medication.

Prognostic Value of Bicycle Ergometry

We have investigated the utility of exercise testing for predicting survival in patients with three-vessel disease and angina pectoris treated medically. In 1983, 392 patients were referred to our institute for coronary angiography because of chest pain. Clinically important coronary artery disease was defined as 50 percent or greater narrowing of the diameter in the left anterior descending, left circumflex, or right coronary arteries. Two hundred fifty-two patients had significant coronary artery disease, 130 had three-vessel disease.

To determine whether exercise testing could stratify patients according to risk, all 89 patients treated medically out of the 130 with three-vessel disease were followed up for cardiac events. The patients were subgrouped according to left ventricular function and the results of the exercise test. The clinical characteristics of the study groups are presented in Table 1.

Table 1—Clinical Characteristics of the 89 Patients With Three-vessel Coronary Artery Disease Treated Medically

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Alive (n = 65)</th>
<th>Dead (n = 24)</th>
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<tbody>
<tr>
<td>Male</td>
<td>59 (81)</td>
<td>19 (79)†</td>
</tr>
<tr>
<td>Female</td>
<td>6 (9)</td>
<td>5 (21)†</td>
</tr>
<tr>
<td>Prior MI*</td>
<td>36 (55)</td>
<td>11 (48)†</td>
</tr>
<tr>
<td>Mean age, yr</td>
<td>48 (±9)</td>
<td>48 (±9)†</td>
</tr>
<tr>
<td>Patients with EF &lt;50%</td>
<td>47 (72)</td>
<td>19 (79)†</td>
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*MI = Myocardial infarction.
†No significant differences were found.

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The survival of patients in different groups according to left ventricular function and the results of exercise testing are summarized in Table 2. Of the ten patients with normal LV function and ST depression, 50 percent died, while of the 35 with abnormal LV function and ST depression, 26 percent died. There was a 20 percent death rate in those with normal LV function and a 35 percent death rate in those with abnormal LV function. As shown by others, the mortality was highest in the groups with decreased LV function. However, in the patients with three-vessel disease and preserved left ventricular function (EF=50 percent), low- and high-risk groups could be identified by the exercise ECG. ST segment depression during the exercise test in this group had a 50 percent mortality, but it did not identify increased risk in those with decreased LV function (26 percent vs 35 percent).

This differential power of exercise-induced ST segment depression to predict mortality needs further investigation. However, it appears that exercise test responses mean different things in different clinical subsets of patients with coronary heart disease.

REFERENCES