ORIGINAL ARTICLE

Stress Echocardiography in the Identification of Left Anterior Descending Coronary Artery Disease in Patients With Inferior Myocardial Infarction and a Positive Exercise Electrocardiography Result

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Introduction and objectives. In patients with an inferior myocardial infarction (IMI), ST-segment depression in left precordial leads during exercise electrocardiography (ExECG) has been associated with left anterior descending coronary artery (LADCA) disease. The aim of this study was to assess the value of stress echocardiography in identifying LADCA disease in patients with IMI and a highly abnormal ExECG result.

Methods. The study included patients with an IMI and an abnormal ExECG result whose coronary angiography findings were available. A highly abnormal ExECG result was defined as ST-segment depression in three or more leads, including V_5. The wall motion score index was calculated and each patient was evaluated echocardiographically for ischemia in LADCA territory.

Results. Of 241 patients who underwent stress ECG, 100 (mean age 57 [11] years) met inclusion criteria. Some 38 had significant LADCA stenosis and, in 75, ExECG gave a highly abnormal result. The sensitivity, specificity and accuracy of a highly abnormal ExECG result for detecting LADCA disease were 74% (60%-88%), 26% (15%-37%), and 44% (34%-54%), respectively. Echocardiographic detection of ischemia had similar sensitivity, at 74%, but higher specificity, at 92% (*P*<.001), and accuracy, at 85% (*P*<.001). Multivariate analysis of clinical, exercise test, and stress echocardiography variables revealed that the only independent predictors of LADCA disease were age (OR=1.070), recent IMI (OR=0.136), and ischemia in LADCA territory (OR=19.9).

Conclusions. Stress echocardiography is a good noninvasive technique for detecting LADCA disease in patients with an IMI. The diagnostic accuracy of a highly abnormal ExECG result is not sufficient for its use in this clinical setting.

Key words: *Left anterior descending coronary artery. Stress echocardiography. Inferior myocardial infarction. Stress testing.*

Ecocardiografía de estrés en la detección de enfermedad de la arteria descendente anterior en pacientes con infarto de miocardio inferior y test de esfuerzo positivo

Introducción y objetivos. En pacientes con infarto de miocardio inferior (IMI), el descenso del segmento ST en las derivaciones precordiales izquierdas en la prueba de esfuerzo electrocardiográfica (PE-ECG) se ha asociado con enfermedad de la arteria descendente anterior (DA). El objetivo del estudio fue analizar el valor de la ecocardiografía de estrés para detectar enfermedad de la DA en pacientes con IMI y PE-ECG severamente positiva.

Métodos. Se seleccionó para el estudio a pacientes con IMI y una PE-ECG positiva que disponían de coronariografía. Se consideró que la PE-ECG severa era positiva si había un descenso significativo del segmento ST en ≥ 3 derivaciones, incluida V5. Se calculó un índice de motilidad regional (IMR) y en cada caso se definió la presencia de isquemia ecocardiográfica en el territorio de la DA (ISQ-DA).

Resultados. De 241 pacientes con infarto inferior que realizaron ecocardiografía de estrés se seleccionó a 100, con una edad media de 57 ± 11 años. En total, 38 pacientes tenían lesión significativa de la DA y 75 presentaron una PE-ECG severamente anormal. La eficacia diagnóstica de predecir enfermedad de la DA en pacientes con PE-ECG severa alcanzó una sensibilidad del 74% (60-88), una especificidad del 26% (15-37) y una precisión diagnóstica del 44% (34-54). La ISQ-DA obtuvo una sensibilidad similar (74%), una especificidad mejor (92%; p < 0,001) y una mayor precisión diagnóstica (85%; p < 0,001). El análisis multivariable de variables clínicas y PE-ECG y la ecocardiografía de estrés mostraron como

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ABBREVIATIONS

LAD: left anterior descending coronary artery.
DASE: dobutamine-atropine stress echocardiography.
SECG: stress echocardiography.
IMI: inferior myocardial infarction.
WMSI: wall motion score index.
EX-ECG: exercise electrocardiography.

predictores independientes únicamente la edad (*odds ratio* [OR] = 1,070), un IMI reciente (OR = 0,136) e ISQ-DA (OR = 19,9).

Conclusiones. La ecocardiografía de estrés es un buen método no invasivo para detectar enfermedad de la DA en el IMI. La PE-ECG severa no proporciona una precisión diagnóstica suficiente para ser utilizada con este fin en la clínica.

Palabras clave: *Arteria descendente anterior. Ecocardiografía de estrés. Infarto de miocardio inferior. Prueba de esfuerzo.*

INTRODUCTION

Exercise electrocardiography (EX-ECG) in patients with previous myocardial infarction provides useful information that offers prognostic value and help in therapeutic decision-making.[1] In patients with inferior myocardial infarction (IMI), ST-segment depression in left precordial leads has been associated with multivessel disease and specifically with left anterior descending coronary artery (LAD) disease, although not all studies have confirmed this finding.[2-5] Stress echocardiography is a technique that makes it possible to establish with great reliability the culprit artery involved in an ischemic territory, mainly in patients with previous myocardial infarction.[6,7] However, few works have studied the value of stress echocardiography in detecting LAD disease in a group of patients whose exercise electrocardiographic findings indicate disease in this artery. Thus, the main aim of this study is to evaluate the role of stress echocardiography in the detection of LAD disease in a group of patients with IMI and whose exercise electrocardiographic findings indicate the presence of multivessel disease. We also studied the advantage of presenting a positive exercise electrocardiography test to identify this finding.

METHODS

Patient Selection

Between June 1994 and June 2001, stress echocardiography was done in 241 patients with IMI. The patients selected were those whose coronary angiography findings were available and where EX-ECG which had yielded positive outcomes. The 3 studies were done in <30 days, >70% in 1 week. Inferior myocardial infarction was diagnosed when typical pain was present, there were increases in creatine kinase (CK) and CK-MB isoenzyme (CK-MB) greater than twice the baseline and ST-segment elevation ≥0.1 mV in 2 or more lower leads. Indications for coronary angiography were made in line with the clinical criteria for our group: angina and heart failure, severe ischemia under exercise electrocardiography, and reduced ejection fraction in the echocardiographic study. Of the 100 patients who fulfilled all the criteria, 81 had presented a recent infarction (<15 days). The study design and data collection were done prospectively and all patients gave written consent to the tests.

Exercise Electrocardiography

A peak symptom-limited treadmill test was done according to the Bruce protocol. The patients with recent IMI underwent the test 6-10 days after the acute episode. A 12-lead electrocardiogram was constantly monitored and blood pressure checked every minute during exercise and 5 min after recovery. ST-segment depression ≥0.1 mV was considered significant compared to the baseline 80 ms after the J point and present in 3 or more consecutive heart beats. The test was stopped when the following were present: angina, severe ST-segment depression, decrease in systolic blood pressure >10 mm Hg compared to the previous stage and significant arrhythmias. Severe electrocardiographic ischemia was defined when there were horizontal or downsloping ST-segment depression ≥0.1 mV in 3 or more consecutive precordial leads, one of which was always V5.

Stress Echocardiography

Stress echocardiography was done in patients with recent IMI 24 to 72 h after EX-ECG. Two different stress echocardiography protocols were used: 25 patients underwent dobutamine-atropine stress echocardiography (DASE) and the remaining 75 patients, stress echocardiography (SECG). The basic reason for this was logistic, since at the beginning of our series no stress echocardiography infrastructure was available in our center and all the stress echocardiography studies were done with dobutamine. DASE was carried out according to