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ORIGINAL ARTICLE

Exaggerated hypertensive response to exercise and myocardial ischemia in patients with known or suspected coronary artery disease[☆]

C. Bouzas-Mosquera^{a,*}, A. Bouzas-Mosquera^b, J. Peteiro^b

^a Facultad de Ciencias Biomédicas y de la Salud, Universidad Europea, Madrid, Spain

^b Unidad de Imagen y Función Cardíacas, Servicio de Cardiología, Hospital Universitario A Coruña, A Coruña, Spain

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KEYWORDS

Exercise;
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Abstract

Objectives: The association between an exaggerated hypertensive response to exercise (EHRE) and the probability of ischemia in stress tests is controversial. Our purpose was to determine the possible association between an EHRE and the development of chest pain and electrocardiographic or echocardiographic ischemia with exercise.

Patients and methods: A retrospective observational study was conducted of 10,047 patients with known or suspected coronary artery disease referred for exercise echocardiography. A logistic regression analysis assessed the effect of developing an EHRE (defined as a maximum systolic blood pressure with exercise ≥ 220 mmHg) and the onset of chest pain and electrocardiographic and echocardiographic changes suggestive of ischemia.

Results: A total of 402 patients developed an EHRE. The rates of angina, electrocardiographic ischemia and echocardiographic ischemia among the patients with an EHRE were 8.2, 16.2 and 22.6% versus 13.8, 14.7 and 27.5%, respectively, for patients without an EHRE ($p = .001$, $p = .4$, $p = .032$). After a multivariate fit, EHRE was associated with a lower probability of exercise-induced angina (OR, 0.44; 95% CI 0.30–0.65; $p < .001$) and echocardiographic ischemia (OR, 0.63; 95% CI 0.48–0.83; $p = .001$) but not with the onset of electrocardiographic ischemia.

Conclusions: EHRE is associated with a lower prevalence of angina and echocardiographic ischemia in patients with known or suspected coronary artery disease.

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* Corresponding author.

E-mail address: mariadelcarmen.bouzas@universidadeuropea.es (C. Bouzas-Mosquera).

PALABRAS CLAVE

Ejercicio;
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Respuesta hipertensiva exagerada al ejercicio e isquemia miocárdica en pacientes con enfermedad coronaria conocida o sospechada**Resumen**

Objetivos: La asociación entre una respuesta hipertensiva exagerada al ejercicio (RHEE) y la probabilidad de isquemia en las pruebas de esfuerzo es controvertida. Nuestro propósito fue determinar la posible asociación entre una RHEE y el desarrollo de dolor torácico y de isquemia electrocardiográfica o ecocardiográfica con el ejercicio.

Pacientes y métodos: Estudio retrospectivo y observacional de 10.047 pacientes con enfermedad coronaria conocida o sospechada referidos para una ecocardiografía de ejercicio. Un análisis de regresión logística evaluó el efecto del desarrollo de una RHEE (definida como una presión arterial sistólica máxima con el ejercicio ≥ 220 mmHg) y la aparición de dolor torácico y de cambios electrocardiográficos y ecocardiográficos sugestivos de isquemia.

Resultados: Un total de 402 pacientes desarrollaron una RHEE. Los porcentajes de dolor torácico anginoso, isquemia electrocardiográfica y ecocardiográfica entre los pacientes con RHEE fueron del 8,2, 16,2 y 22,6%, frente al 13,8, 14,7 y 27,5%, respectivamente, en pacientes sin RHEE ($p=0,001$, $p=0,4$, $p=0,032$). Tras un ajuste multivariado, la RHEE se asoció con una menor probabilidad de aparición de dolor torácico anginoso inducido por el esfuerzo (OR 0,44; IC 95% 0,30-0,65; $p<0,001$) y de isquemia ecocardiográfica (OR 0,63; IC 95% 0,48-0,83; $p=0,001$), pero no con el desarrollo de isquemia electrocardiográfica.

Conclusiones: La RHEE se asocia con una menor prevalencia de dolor torácico anginoso e isquemia ecocardiográfica en pacientes con enfermedad coronaria conocida o sospechada.

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Background

Exercise echocardiography is a recognized test for the functional assessment of coronary artery disease. This technique helps assess various elements of the ischemic cascade, such as angina pectoris, electrocardiographic changes and segmental contractility abnormalities of the left ventricle wall.

There is little information on the possible association between the exaggerated hypertensive response to exercise (EHRE) and the onset of myocardial ischemia. It has been speculated that the intense increase in blood pressure (BP) during exercise and the subsequent increase in myocardial oxygen consumption could trigger subendocardial ischemia, even in the absence of significant coronary stenosis.¹ However, this possible association is controversial and has not been investigated through echocardiography on the treadmill and at peak exercise.¹⁻⁵

The aim of this study was to analyze the association between EHRE and the onset of angina, ischemic electrocardiographic changes and segmental contractility abnormalities in patients with known or suspected coronary artery disease who underwent treadmill exercise stress echocardiography.

Material and methods**Patients**

This was an observational retrospective study on a database of 12,215 patients, belonging to the reference

healthcare area of a tertiary hospital, who underwent stress echocardiography between March 1, 1995 and June 28, 2013. We excluded 1218 patients from the study for using beta-blockers in the 48 h prior to the test⁶ and 950 for whom the BP did not increase above its baseline value during the exercise.^{7,8}

Clinical variables

The presence of diabetes mellitus, arterial hypertension (AHT) and hypercholesterolemia was based on the personal history and on taking specific drugs. A prior history of ischemic heart disease was defined as a history of myocardial infarction, coronary revascularization or angiographic documentation of significant coronary stenosis. We established the following chest pain groups: typical angina, probable or atypical angina and chest pain of nonischemic origin, according to the Diamond scale.⁹

In terms of baseline electrocardiographic data, we recorded the rhythm and those findings that could hinder the interpretation of the test (left bundle-branch block, pacemaker rhythm, left ventricular hypertrophy with overload pattern, digitalis impregnation, preexcitation syndrome or other repolarization disorders).

Stress test

All patients underwent treadmill exercise stress echocardiography. We obtained data on the heart rate (HR), BP (using the auscultatory method) and 12-lead electrocardiogram

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