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Relationship Between Carotid Intima-media Thickness and the Results of Exercise Echocardiography in Patients With Suspected Coronary Disease

Relación entre el grosor intimomedial carotídeo y el resultado del ecocardiograma de ejercicio en pacientes con sospecha de enfermedad coronaria

To the Editor,

The diagnostic value of myocardial ischemia tests is influenced by the pretest probability of coronary artery disease, which is essentially determined by the clinical characteristics of chest pain and the age and sex of the patient. It has been suggested that subclinical atherosclerotic carotid artery disease detected by ultrasound might be associated with an increased risk of heart disease. The 2013 ESC guidelines on the management of stable coronary artery disease recommends the use of carotid ultrasound to evaluate the presence of plaque and measure carotid intima-media thickness (CIMT) in patients with suspected coronary disease but without demonstrated atherosclerotic disease (recommendation IIa with level of evidence C).[1] The recommendation is based on expert consensus opinion but is not supported by evidence from specific studies. We wished to investigate whether an increase in CIMT with or without the presence of plaque on a carotid ultrasound performed before an exercise echocardiogram is associated with a positive result.

We studied patients with chest pain referred from the cardiology department of our hospital for exercise echocardiography. Patients with a history of coronary disease or segmental wall-motion abnormalities in the baseline echocardiogram were excluded. CIMT measurements were taken for both carotid arteries over a 1-cm segment in the posterior wall, 1 cm from the bulbs. Mean CIMT values have been shown to provide a better indication of atherosclerotic burden in hypertensive patients,[2] and a CIMT of over 0.9 mm is considered to be a marker of target organ damage.

The exercise echocardiogram was considered to be positive if it induced wall-motion abnormalities in at least 2 contiguous segments.

Fifty-nine patients (mean age, 62.7 years; 59% women) with no history of heart disease were studied. Their characteristics are summarized in the Table. The probability of coronary artery disease based on the manifestations of chest pain and the age and sex of the population was 40% (95%CI, 35.1-46.5). Twenty-seven patients (45%), 16 (59%) of whom were men, had carotid artery disease (CIMT > 0.9 mm with or without plaque). The exercise echocardiogram was positive in 10 patients (16%), 8 of whom were men (80%). No complications were observed during the tests. A positive exercise echocardiogram was significantly associated with carotid artery disease (Figure).

The odds ratio for an association between a CIMT of over 0.9 mm (with or without plaque) and a positive exercise echocardiogram was 6.3 (95%CI, 1.2-33.3). The following factors were also associated with a positive result: a higher pretest probability of coronary artery disease, the presence of typical angina, baseline ejection fraction (> 55% in all cases), prior use of aspirin, and male sex.

Ours is the first study to specifically analyze the ability of CIMT to predict a positive exercise echocardiogram. An association between carotid disease and coronary artery disease has previously been described. While the study in question did not detect an association between carotid disease and exercise echocardiography, the presence of carotid plaque appeared to increase the predictive power of the stress test for diagnosing coronary artery disease.[3] The main limitation of our study is the few patients analyzed and the small number of positive exercise echocardiograms. The sample, however, was large enough to test the hypothesis with sufficient statistical power. Larger studies are needed to further investigate the variables identified as independent predictors of a positive echocardiogram. The results of our study support the recommendations in the 2013 ESC guidelines.[1] While it is known that a positive ischemia test is not synonymous with obstruction of the main epicardial coronary arteries, a negative exercise echocardiogram is associated with good prognosis (1-year mortality of < 1%),[4] and a positive echocardiogram is associated with worse prognosis, even in patients without angiographically significant coronary artery disease.[5]

The findings of a recent study suggest that exercise electrocardiography had little prognostic value in patients with a low pretest probability of coronary artery disease,[6] and standard risk scales have also been claimed to have low predictive power.

In conclusion, CIMT measurement offers additional information, and by modifying the pretest probability of coronary artery

Table
Characteristics of Patients According to Exercise Echocardiogram Result

	EE (+)	EE (–)	*P* value
Patients, no.	10	49	
Age, y	67.60 ± 8.10	61.73 ± 10.08	0,090
Male sex	8 (80)	16 (32.6)	0,005
Hypertension	7 (70)	32 (65.3)	1
Diabetes	4 (40)	18 (36.7)	1
Hypercholesterolemia	6 (60)	21 (42.9)	0,520
Active smoking	2 (20)	4 (8.2)	0,579
Family history of early ischemic heart disease	1 (10)	7 (14.3)	1
Peripheral vascular disease	2 (20)	2 (4.1)	0,257
Lung disease	1 (10)	7 (14.3)	1
Aspirin use	7 (70)	11 (22.4)	0,009
Use of negative chronotropic agents	2 (20)	10 (20.4)	1
Pretest probability of coronary artery disease	66.7 ± 17.2	35.5 ± 19	< 0,001
Typical angina	5 (50)	8 (16.3)	0,019
Atypical angina/noncardiac chest pain	5 (50)	41 (83.7)	0,019
Normal resting electrocardiogram	4 (40)	37 (75.5)	0,065
Exercise time, min	4.90 ± 1.91	4.14 ± 2.03	0,283
MET	6.00 ± 2.11	5.59 ± 1.61	0,491
Heart rate achieved, bpm	141.80 ± 20.53	133.98 ± 20.07	0,268
MPHR, bpm	92.70 ± 11.72	84.41 ± 10.67	0,032
Resting ejection fraction, %	59.70 ± 2.54	62.14 ± 3.54	0,043
Exercise ejection fraction, %	60.50 ± 7.98	71.43 ± 4.56	< 0,001
CIMT > 0.9 mm with or without plaque	8 (80.0)	19 (38.8)	0,042
CIMT, mm	1.07 ± 0.26	0.82 ± 0.15	< 0,001
Plaque	3 (30.0)	5 (10.2)	0,246

EE, exercise echocardiogram; CIMT, carotid intima-media thickness; MPHR, maximum predicted heart rate.
Data expressed as No. (%) or mean ± SD unless specified otherwise.

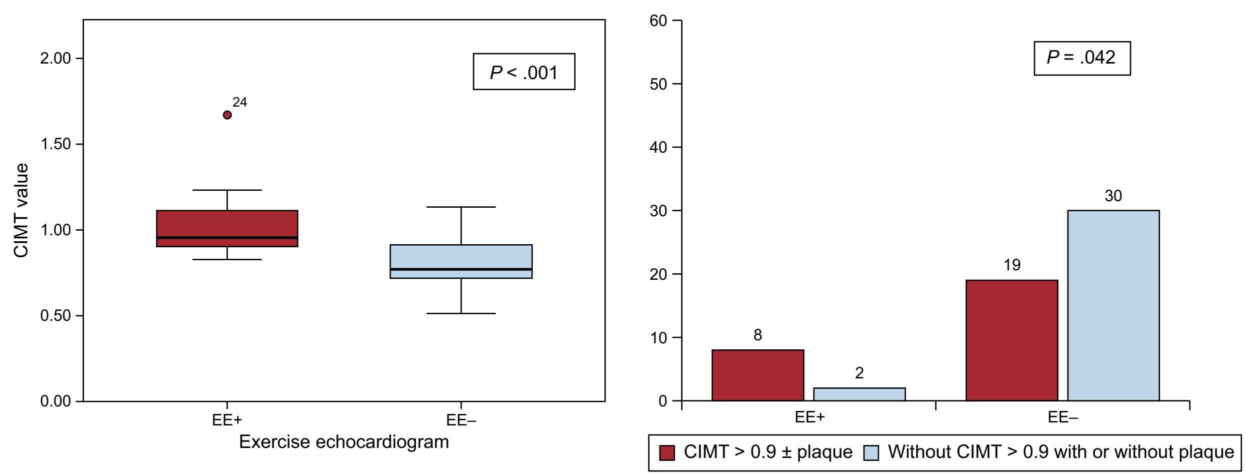

Figure. Association between carotid intima-media thickness and a positive exercise echocardiogram. EE, exercise echocardiogram; CIMT, carotid intima-media thickness.

disease, it may help to guide decision-making. Finally, detection of carotid disease should encourage clinicians to implement more active cardiovascular disease prevention measures.

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Diagnostic Value of NT-proBNP for Early Identification of Chagas Cardiomyopathy in Non-endemic Areas

Valor diagnóstico del NT-proBNP para la detección precoz de cardiopatía chagásica en áreas no endémicas

To the Editor,

Chagas disease is the first cause of nonischemic heart disease in Latin America and is associated with considerable morbidity and mortality.[1] The prevalence of this condition has increased in Europe as a consequence of current migratory trends.[2] Once the heart disease is established in this condition, there is no benefit from treating the infection.[3] Hence, it is essential to achieve a prompt diagnosis to change the course and prognosis of the disease.

Natriuretic peptide analysis has shown diagnostic and prognostic value in several cardiomyopathies. Our aim was to achieve prompt detection of Chagas cardiomyopathy by analyzing the N-terminal pro-B-type natriuretic peptide (NT-proBNP), evaluating several echocardiographic parameters of diastolic dysfunction and systolic function, and determining the regional systolic shortening by myocardial strain measurement.

A prospective, observational study was carried out in 85 patients with positive serology for *Trypanosoma cruzi* between January 2015 and June 2016. All patients underwent NT-proBNP determination by chemiluminescence immunoassay, electrocardiography (ECG), and transthoracic echocardiography (TTE). In patients with abnormalities, cardiac magnetic resonance (MR) imaging was additionally performed.

The statistical analysis used SPSS v.21. Correlations of NT-proBNP concentrations with the ejection fraction and diastolic dysfunction parameters (mainly the indexed atrial volume and the E/e' ratio) were analyzed using the Pearson test. The sensitivity and specificity of NT-proBNP for predicting Chagas cardiomyopathy was evaluated using a cutoff value of > 125 pg/mL, and the various echocardiographic parameters were compared after the patients were divided into 3 disease groups.

In our cohort, 95.3% were from Bolivia, 74.1% were women, and the mean age was 43 (range, 18-63) years. From the clinical viewpoint, 62.4% of the patients were asymptomatic. The most commonly reported symptom was palpitations in 25.9% of patients; only 9.5% were in New York Heart Association (NYHA) functional class $\geq$ 2. All patients had normal renal function and none were receiving treatment for heart failure at the time of inclusion.

Patients were classified into 3 disease groups based on their characteristics: group 1 (indeterminate phase, positive serology with no abnormalities on ECG or TTE, n = 64); group 2 (2 or more of the ECG changes typically seen in Chagas disease, with normal TEE

Table
Main Variables by Groups

	Group 1	Group 2	Group 3	P^a
Patients	64 (75.3)	12 (14.1)	9 (10.6)	
LVEF, %	67.4	66.9	49.3	< .001
Left ventricular end-diastolic volume (indexed), cm^3/m^2	48.9	51.2	57.0	.20
Left atrial end-diastolic volume (indexed), cm^3/m^2	26.3	24.5	31.3	.22
E/e' (lateral)	6.8	6.6	10.9	.02
E/e' (medial)	9.9	8.4	11.7	.14
NT-proBNP, pg/mL	42 [26.8-70.5]	84 [27.8-149.5]	126 [36.5-238.5]	< .01
NT-proBNP >125 pg/mL, %	7.8	33.3	55.6	< .001
Total longitudinal strain, %[b]	21.9	23.5	20.0	.047
Edema on MR STIR sequences	7 (14.3)	11 (36.4)	5 (80)	.07
Delayed enhancement on MR, %	0	18.2	60	.04

LVEF, left ventricular ejection fraction; NT-proBNP, N-terminal pro-B-type natriuretic peptide; MR, magnetic resonance; STIR, short tau inversion recovery.
Values are expressed as No. (%) or median [interquartile range], unless otherwise indicated.
[a] Calculated by ANOVA for mean values and by the chi-square test for percentages.
[b] Refers to the total longitudinal strain value, calculated as the mean of systolic myocardial shortening values in the 4-, 2-, and 3-chamber views.