Journal of the American College of Cardiology
© 2010 by the American College of Cardiology Foundation
Published by Elsevier Inc.

Vol. 56, No. 4, 2010
ISSN 0735-1097/$36.00
doi:10.1016/j.jacc.2009.12.073

CME

Exercise-Induced Changes in Degenerative Mitral Regurgitation

Julien Magne, PhD, Patrizio Lancellotti, MD, PhD, Luc A. Piérard, MD, PhD
Liège, Belgium

JACC JOURNAL CME

This article has been selected as the month's *JACC* Journal CME activity.

Accreditation and Designation Statement

The American College of Cardiology Foundation (ACCF) is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

The American College of Cardiology designates the educational activities in *JACC* for a maximum of 1 AMA PRA Category 1 Credit. Physicians should only claim credit commensurate with the extent of their participation in the activity.

Method of Participation and Receipt of CME Certificate

To obtain credit for *JACC* CME, you must:

1. Be an ACC member or *JACC* subscriber
2. Carefully read and reflect upon the CME-designated article available online and in this issue of *JACC*.
3. Answer the posttest questions and complete the brief evaluation available at http://cme.jaccjournals.org.
4. Claim your CME credit and receive your certificate electronically by following the instructions given at the conclusion of the online activity.

CME Objective for This Article: At the conclusion of this activity, the learner will be able to evaluate the relationship between exercise-induced changes in mitral regurgitation and systolic pulmonary artery pressure and identify the potential impact on symptom-free survival.

CME Editor Disclosure: *JACC* CME Editor Ajit Raisinghani, MD, FACC, reports that he has no financial relationships or interests to disclose.

Author Disclosures: Dr. Magne was supported by a grant from the Fonds de la Recherche en Santé du Québec, Québec, Canada.

Medium of Participation: Print (article only); online (article and quiz)

CME Term of Approval:

Issue date: July 20, 2010
Expiration date: July 19, 2011

Continuing Medical Education (CME) is available for this article. From the Department of Cardiology, University Hospital Sart Tilman, University of Liège, Liège, Belgium. Dr. Magne was supported by a grant from the Fonds de la Recherche en Santé du Québec, Québec, Canada.

Manuscript received October 26, 2009; revised manuscript received December 8, 2009, accepted December 23, 2009.

Exercise-Induced Changes in Degenerative Mitral Regurgitation

Objectives We sought to quantify exercise-induced changes in patients with degenerative mitral regurgitation (MR), to examine the relationship between exercise-induced changes in MR and in systolic pulmonary artery pressure (PAP), and to identify their potential impact on symptom-free survival.

Background MR severity can change during exercise in patients with functional MR. Quantified changes in MR severity during exercise remain undetermined in patients with degenerative MR.

Methods Resting and bicycle exercise Doppler-echocardiography were performed in 61 asymptomatic patients (age 62 ± 14 years) with moderate to severe degenerative MR (i.e., mitral valve prolapse or flail). Mitral regurgitation was quantified at rest and exercise with effective regurgitant orifice (ERO) area and regurgitant volume calculated with the proximal isovelocity surface area (ERO_P) and the quantitative Doppler (ERO_D) methods.

Results At rest, ERO_P and ERO_D were well-correlated ($r = 0.87$, $p < 0.0001$), but ERO_D was larger than ERO_P (54 ± 21 mm^2 vs. 42 ± 24 mm^2, $p < 0.0001$). During exercise, mean ERO and regurgitant volume markedly increased in 32% of patients by ≥10 mm^2 and ≥15 ml, respectively. There was good correlation between exercise ERO_P and ERO_D ($r = 0.84$, $p < 0.0001$). Changes in systolic PAP were correlated with changes in ERO and regurgitant volume ($r = 0.59$, $p = 0.02$ and $r = 0.60$, $p = 0.02$). Patients with a marked increase in regurgitant volume during exercise had lower symptom-free survival than those in whom MR decreased or remained unchanged ($p = 0.0015$).

Conclusions Degenerative MR might be dynamic and increases during exercise in one-third of patients. Marked changes in MR severity are associated with exercise-induced changes in systolic PAP and reduced symptom-free survival. (J Am Coll Cardiol 2010;56:300–9) © 2010 by the American College of Cardiology Foundation

Degenerative mitral regurgitation (MR) is the second most prevalent valvular disease (1) and, when severe, is associated with poor outcome (2,3). The management of patients with asymptomatic severe MR remains controversial (4–6). The current American College of Cardiology/American Heart Association guidelines (7) recommend mitral valve surgery when symptoms, left ventricular (LV) dysfunction, atrial fibrillation, or pulmonary hypertension occur or, in the absence of such criteria, when the likelihood of successful repair is >90%. In contrast, patients with moderate MR should not be operated (Class III, Level of Evidence: C). However, a recent study indicated that patients with moderate MR initially have a low complication rate that rises over time (3). Thus, some patients with moderate MR could have mid-term morbidity and mortality risk similar to patients with severe MR, possibly because of progression of regurgitation.

See page 310

Functional MR is characteristically dynamic and sensitive to changes in ventricular size and loading conditions, regardless of the degree of resting MR. Exercise-induced changes in MR can be reliably quantified during exercise Doppler echocardiography and are unrelated to the degree of MR at rest (8,9). Large exercise-induced increases in functional MR identify patients at high risk of exertional dyspnea, acute pulmonary edema, and poor outcome (10–13). We hypothesized that similar dynamic changes can also occur in patients with degenerative MR. Indeed, the effect of exercise on quantified MR severity is still unexplored in such patients. Therefore the aims of this study were to determine: 1) whether degenerative MR can be dynamic; 2) whether eventual exercise-induced changes in MR are related to exercise-induced changes in systolic pulmonary arterial pressure (PAP); and 3) the potential influence of these changes on symptom-free survival.

Methods

Population. We prospectively examined 74 consecutive asymptomatic patients with degenerative MR due to mitral valve prolapse and with normal LV function (ejection fraction >60%, end-systolic diameter <45 mm) in our stress echocardiography laboratory. Of this population, 6 patients were excluded for ≥1 of the following criteria: <moderate MR (effective regurgitant orifice [ERO] area <20 mm^2 or regurgitant volume <30 ml), concomitant valvular stenosis or regurgitation, significant atrial arrhythmias, inability to exercise, and stress-induced myocardial ischemia. In addition, 7 other patients had nonoptimal acoustic window to accurately quantify MR and therefore were excluded from the final analysis. The remaining 61 patients (age 62 ± 14 years, 51% of males) were submitted to rest and exercise Doppler echocardiography.

Exercise echocardiography. A symptom-limited graded bicycle exercise test was performed in the semisupine position on a tilting exercise table. After an initial workload of 25 W maintained for 2 min, the workload was increased every 2 min by 25 W. Blood pressure and a 12-lead electrocardiogram were recorded every 2 min. Two-dimensional and Doppler echocardiographic imaging was available throughout the test.