JACC: CARDIOVASCULAR IMAGING
VOL. 7, NO. 2, 2014

ISSN 1936-878X/$36.00
PUBLISHED BY ELSEVIER INC.
http://dx.doi.org/10.1016/j.jcmg.2013.08.011

CME

iREVIEWS

STATE-OF-THE-ART PAPER

Exercise Testing in Asymptomatic Severe Aortic Stenosis

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

JACC: CARDIOVASCULAR IMAGING CME

CME Editor: Ragavendra R. Baliga, MD

This article has been selected as this issue's CME activity, available online at http://imaging.onlinejacc.org by selecting the CME tab on the top navigation bar.

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 ACCF designates this Journal-based CME activity for a maximum of 1 *AMA PRA Category 1 Credit(s)*™. 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 this CME activity, you must:

1. Be an ACC member or *JACC: Cardiovascular Imaging* subscriber.
2. Carefully read the CME-designated article available online and in this issue of the journal.
3. Answer the post-test questions. At least 2 out of the 3 questions provided must be answered correctly to obtain CME credit.
4. Complete a brief evaluation.
5. Claim your CME credit and receive your certificate electronically by following the instructions given at the conclusion of the activity.

CME Objective for This Article: At the end of this activity, the reader should be able to: 1) evaluate the usefulness and clinical implication of exercise stress echocardiography in asymptomatic patients with severe aortic stenosis; and 2) analyze the exercise echocardiographic findings identifying patients at higher risk of reduced event-free survival.

CME Editor Disclosure: *JACC: Cardiovascular Imaging* CME Editor Ragavendra R. Baliga, MD, has reported that he has no relationships to disclose.

Author Disclosure: All authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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

CME Term of Approval:
Issue Date: February 2014
Expiration Date: January 31, 2015

From the Department of Cardiology, Heart Valve Clinic, University Hospital Sart Tilman, University of Liège, Liège, Belgium. All authors have reported that they have no relationships relevant to the contents of this paper to disclose.

Manuscript received March 8, 2013; revised manuscript received July 26, 2013, accepted July 26, 2013.

Exercise Testing in Asymptomatic Severe Aortic Stenosis

The management and the clinical decision making in asymptomatic patients with aortic stenosis are challenging. An "aggressive" management, including early aortic valve replacement, is debated in these patients. However, the optimal timing for surgery remains controversial due to the lack of prospective data on the determinants of aortic stenosis progression, multicenter studies on risk stratification, and randomized studies on patient management. Exercise stress testing with or without imaging is strictly contraindicated in symptomatic patients with severe aortic stenosis. Exercise stress test is now recommended by current guidelines in asymptomatic patients and may provide incremental prognostic value. Indeed, the development of symptoms during exercise or an abnormal blood pressure response are associated with poor outcome and should be considered as an indication for surgery, as suggested by the most recently updated European Society of Cardiology 2012 guidelines. Exercise stress echocardiography may also improve the risk stratification and identify asymptomatic patients at higher risk of a cardiac event. When the test is combined with imaging, echocardiography during exercise should be recommended rather than post-exercise echocardiography. During exercise, an increase >18 to 20 mm Hg in mean pressure gradient, absence of improvement in left ventricular ejection fraction (i.e., absence of contractile reserve), and/or a systolic pulmonary arterial pressure >60 mm Hg (i.e., exercise pulmonary hypertension) are suggestive signs of advanced stages of the disease and impaired prognosis. Hence, exercise stress test may identify resting asymptomatic patients who develop exercise abnormalities and in whom surgery is recommended according to current guidelines. Exercise stress echocardiography may further unmask a subset of asymptomatic patients (i.e., without exercise stress test abnormalities) who are at high risk of reduced cardiac event free survival. In these patients, early surgery could be beneficial, whereas regular follow-up seems more appropriate in patients without echocardiographic abnormalities during exercise. (J Am Coll Cardiol Img 2014;7:188–99)

Aortic stenosis (AS) is the most common valvular disease and the third most prevalent form of cardiovascular disease in the Western world. Its prevalence increases with population aging and is present in 3% to 7% of patients over 65 years of age (1). The diagnosis of AS is classically based on echocardiography and may be supplemented by other cardiovascular imaging modalities. The majority of AS patients are asymptomatic but have an increased risk of untoward events such as ventricular dysfunction, symptomatic deterioration, heart failure, and even death in a significant proportion of them. In 2 recent studies including asymptomatic patients with at least moderate AS, a mean rate of cardiovascular death and of sudden death of 3.7% and 1.55% respectively, were reported during a median follow-up of 16 to 18 months (2,3). In this regard, "aggressive" management, including early aortic valve replacement (AVR), is debated in asymptomatic patients. The optimal timing for AVR remains controversial due to the lack of prospective data on the determinants of AS progression, multicenter studies on risk stratification, and randomized studies on patient management. In the recently updated European Society of Cardiology (ESC) guidelines and in the current American College of Cardiology/American Heart Association (ACC/AHA) guidelines (4), based on a consensus of experts, the only class I indication for performing an AVR in patients with severe AS is the presence of symptoms at rest or during an exercise test and/or the presence of left ventricular (LV) systolic dysfunction, defined as LV ejection fraction <50%. Initial symptoms experienced by patients with AS are often subtle or insidious and can be difficult to identify purely on clinical grounds. Many patients either fail to acknowledge their symptoms or do not report their symptoms promptly. The development of symptoms signifies a dramatic change in the natural history of the condition with a reported average survival of <2 years. Moreover, patients who become symptomatic are at significant risk of developing adverse cardiac events while waiting for surgery, and perioperative risk increases significantly with the severity of symptoms. Of note, women seem to be less likely than men to be referred for surgery despite symptoms and severe AS. This adverse