

Chad McBride, MD,  
Gary Kelsberg, MD  
University of Washington  
Family Medicine Residency at  
Valley Medical Center, Renton

Nancy Calabretta, MS, MEd  
UMDNJ Camden Campus  
Library at Cooper University  
Hospital, Camden, NJ

## What is the prognostic value of stress echocardiography for patients with atypical chest pain?

### EVIDENCE-BASED ANSWER

Patients with atypical chest pain and no history of cardiovascular events (coronary artery disease, unstable angina, or history of percutaneous transthoracic coronary angioplasty [PTCA]) and a negative stress echocardiography test are unlikely to experience a cardiovascular

event in the next 1 to 4 years. However, the positive predictive value of the test in this population is low, indicating that a positive stress echocardiography is less useful for prognostic purposes (strength of recommendation: **B**, based on multiple cohort studies).

### CLINICAL COMMENTARY

#### Using stress echocardiography reduces need for diagnostic cardiac catheterization for atypical chest pain

Patients presenting to emergency and urgent care departments with atypical chest pain are a dilemma whenever their ECG and biomarkers are nondiagnostic. Graded exercise stress testing to further define risk is not effective in many patient populations: including some women, patients with mobility problems, and patients with underlying conduction issues such as pre-excitation syndromes, left bundle

branch blocks, and ventricular pacemakers. Stress echocardiography is a reasonable alternative for such patients. While physicians may take a negative test at face value in this clinical setting, a positive test is not diagnostic and will often necessitate further workup. Using stress echocardiography therefore reduces but does not eliminate the need for diagnostic cardiac catheterization for atypical chest pain.

Timothy Huber, MD  
Oroville, Calif

### Evidence summary

A prospective cohort study<sup>1</sup> evaluated dobutamine or dipyridamole pharmacologic stress echocardiography among 904 primary care patients with either typical or atypical chest pain. Patients were enrolled into the study if they had normal resting wall motion, sinus rhythm, and had no history of coronary artery disease,

unstable angina, or PTCA. Patients (average age 61 years, 42% men) were followed for an average of 44 months for primary cardiovascular endpoints (fatal or nonfatal myocardial infarction [MI], unstable angina, PTCA, or cardiac death). A negative or positive stress echocardiography is defined as the absence or presence of abnormal cardiac wall motion on

either exercise or pharmacologic stress echocardiography. Eighteen percent of patients had a positive pharmacologic stress echocardiography. Over the length of the study, 81 of 904 patients (9%) suffered a cardiovascular event. Patients with a negative pharmacologic stress echocardiography had a mean annual probability of a cardiovascular event of 0.8% vs 8.5% with a positive pharmacologic stress echocardiography ( $P < .0001$ ). The 4-year infarct-free negative predictive value (NPV) of pharmacologic stress echocardiography was 97%, and the positive predictive value (PPV) was 70%.

A similar prospective cohort study<sup>2</sup> evaluated 105 patients (50% men) with atypical chest pain in an emergency department setting with either exercise or dobutamine/atropine stress echocardiography. The average patient age was 55 years and follow-up was 2.8 years. Patients were clinically stable, had normal or nondiagnostic electrocardiogram (ECG), normal cardiac enzymes, normal left ventricular function, and no history of coronary artery disease or unstable angina. Cardiovascular endpoints included fatal or nonfatal MI, unstable angina, PTCA, or cardiac death. A total of 7 patients (7%) suffered a cardiovascular event during the follow-up period. Positive stress echocardiography results occurred for 9% of patients. The NPV was 99% and the PPV was 75%.

Three other cohort studies<sup>3-5</sup> evaluated exercise or dobutamine/atropine stress echocardiography for a total of 615 patients (48%–67% men, average age 56–58 years) presenting to an emergency department with classical cardiac or atypical chest pain. Patients had normal or nondiagnostic ECG, negative cardiac enzymes, and either no history of coronary artery disease<sup>3,4</sup> or known coronary artery disease of unknown significance.<sup>5</sup> A positive stress echocardiography was obtained for 4.8% to 42% of patients in the cohorts. During 6 months of follow-up, cardiovascular events occurred in 4 of 145 patients (3%),<sup>3</sup> 22 of 227 patients (6%),<sup>4</sup> and in 11 of 80

patients (14%).<sup>5</sup> At 6-month follow-up, exercise stress echocardiography had a NPV of 99.3% and a PPV of 43%.<sup>3</sup> Dobutamine/atropine stress echocardiography had a NPV of 95% to 96% and a PPV of 25% to 31%.<sup>4,5</sup>

One retrospective review<sup>6</sup> evaluated exercise and dobutamine/atropine stress echocardiography and stress ECG for 661 low-risk outpatients (48% men, average age 58 years) with atypical chest pain. All patients had normal left ventricular function and no history of coronary artery disease and were followed for an average of 23 months. A positive stress echocardiography test occurred among 16% of the patient population.

During follow-up, 41 of 661 patients (6%) suffered a cardiovascular event. For either exercise or dobutamine/atropine stress echocardiography, the NPV was 99% at 12 months and 96% at 30 months. Patients with a positive stress echocardiography test and a negative stress ECG had a 66% event-free survival rate. Event-free survival rate for patients with a negative stress echocardiography and a positive or negative stress ECG was 97% and 96%, respectively.

#### Recommendations from others

The American College of Cardiology<sup>7</sup> gives a Class I recommendation (tests for which there is evidence or general agreement that a given procedure or treatment is useful and effective) for standard echocardiogram for evaluation of chest pain for patients with suspected acute myocardial ischemia (when baseline ECG and other laboratory markers are nondiagnostic and when the study can be obtained during pain or within minutes after its abatement).

It gives a Class IIa recommendation (tests for which there is conflicting evidence or divergence of opinion, but favoring usefulness) to stress echocardiography for the detection of myocardial ischemia for women with an intermediate pretest likelihood of coronary artery disease. It also gives a Class IIa recommendation to

#### FAST TRACK

**Stress echocardiography reduces but does not eliminate the need for diagnostic cardiac catheterization**

stress echocardiography for determining the prognosis of myocardial ischemia among patients for whom ECG assessment is less reliable. This group comprises patients with the following ECG abnormalities: pre-excitation syndrome (such as Wolff-Parkinson-White), electronically paced ventricular rhythm, more than 1 mm of ST depression at rest, and complete left bundle branch block.

#### REFERENCES

1. Amici E, Cortigiani L, Coletta C, et al. Usefulness of pharmacologic stress echocardiography for the long-term prognostic assessment of patients with typical versus atypical chest pain. *Am J Cardiol* 2003; 91:440-442.
2. Colon PJ 3rd, Cheirif J. Long-term value of stress echocardiography in the triage of patients with atypical chest pain presenting to the emergency department. *Echocardiography* 1999; 16:171-177.
3. Buchsbaum M, Marshall E, Levine B, et al. Emergency department evaluation of chest pain using exercise stress echocardiography. *Acad Emerg Med* 2001; 8:196-199.
4. Bholasingh R, Cornel JH, Kamp O, et al. Prognostic value of predischARGE dobutamine stress echocardiography in chest pain patients with a negative cardiac troponin T. *J Am Coll Cardiol* 2003; 41:596-602.
5. Geleijnse ML, Elhendy A, Kasprzak JD, et al. Safety and prognostic value of early dobutamine-atropine stress echocardiography in patients with spontaneous chest pain and a non-diagnostic electrocardiogram. *Eur Heart J* 2000; 21:397-406.
6. Colon PJ 3rd, Mobarek SK, Milani RV, et al. Prognostic value of stress echocardiography in the evaluation of atypical chest pain patients without known coronary artery disease. *Am J Cardiol* 1998; 81:545-551.
7. ACC/AHA/ASE 2003 guideline update for the clinical application of echocardiography: A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. (ACC/AHA/ASE Committee to update the 1997 guidelines for the clinical application of echocardiography.) Available at: [www.acc.org/qualityandscience/clinical/guidelines/echo/index\\_clean.pdf](http://www.acc.org/qualityandscience/clinical/guidelines/echo/index_clean.pdf). Accessed on September 6, 2006.