

Editorial



False-positive Stress Echocardiography: Not as Simple as It Looks

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Conflict of Interest

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Stress echocardiography is a test with high sensitivity and specificity for detecting significant coronary artery stenosis, with similar diagnostic and prognostic accuracy to radionuclide stress perfusion imaging.¹⁾ Its average sensitivity and specificity have been reported to be 88% and 83%, respectively.²⁾ As there are no biohazards or environmental impacts, stress echocardiography is the preferred screening method for coronary ischemia in spite of its dependence on operator training and image quality. The three most common stressors used in stress echocardiography are exercise, dobutamine, and dipyridamole, which are equally potent stressors for induction of regional wall motion abnormalities in the presence of critical epicardial artery stenosis.²⁾ The endpoint for detection of myocardial ischemia is stress-induced transient change in regional wall motion. Wall motion assessment in stress echocardiography is more specific than perfusion imaging for predicting significant coronary stenosis (> 50% diameter coronary artery stenosis on coronary angiography),²⁾ even though false positives are a continuing challenge for stress echocardiography.

In this issue of the journal, Guerreiro et al.³⁾ investigated clinical and echocardiographic characteristics of false-positive results of echocardiography from an original 5,256 exercise stress echocardiograms. They found a prevalence of false-positive stress echocardiography of 24% among 300 positive stress results. Patients with a false-positive stress test showed a median 23% pre-test probability of coronary artery disease, which was significantly lower than that of those with a true-positive result (32%). A false-positive result was associated with female sex, non-diabetes, and lower peak wall motion score index. This result was consistent with previous studies showing false-positive results related to female sex, non-diabetes, non-hypertension, and no history of coronary artery disease. These findings suggest that such false positives are more common in the population at lower risk for coronary artery disease.⁴⁾⁵⁾ The other reported predictor for false-positive results was hypertensive response to exercise.⁴⁾ Accounting for these predictors of false-positive stress echocardiography results could improve interpretation of stress echocardiography and limit use of unnecessary coronary angiography in a low-risk population.

It has been reported that numbers of false-positive stress tests are increasing.⁶⁾ However, one of the basic premises when interpreting false-positive results of screening tests is that the

prevalence of false-positive results is determined by disease prevalence among the studied population, as positive predictive value is calculated based on the following equation⁷⁾:

$$\text{Positive predictive value} = \frac{\text{sensitivity} \times \text{prevalence}}{\text{sensitivity} \times \text{prevalence} + (1 - \text{specificity}) \times (1 - \text{prevalence})}$$

Therefore, some argue that the recent high numbers of false-positive stress tests could be the result of overestimation of pretest likelihood of significant coronary artery disease and application of stress echocardiography to the population with low cardiovascular risk.⁸⁾

The clinical implications of false-positive stress echocardiography remain unclear. Traditionally, patients with false-positive stress echocardiography have been treated as if they had no significant coronary artery disease risk. False-positive stress echocardiography is considered benign, and patients with false-positive tests are usually dismissed from the care of cardiologists. However, recent studies have suggested that patients with abnormal stress echocardiography results are at higher risk for cardiovascular events compared to patients with negative results, irrespective of angiographic findings.^{6,9)} Therefore, consideration should be given to false-positive stress echocardiography, and further investigation is needed to unravel the pathophysiology of poor prognosis even in the absence of coronary artery disease.

The suggested pathological mechanisms for false-positive stress echocardiography are microvascular abnormalities, vasomotor changes, endothelial dysfunction, and small vessel coronary artery disease.²⁾ Some authors have suggested that some false-positive stress echocardiograms may represent a type of apical ballooning syndrome.¹⁰⁾ However, the evidence remains insufficient for determining a clear pathophysiology in false-positive stress echocardiography. Further studies similar to that of Guerreiro et al.³⁾ are needed to improve interpretation of stress echocardiography. Additional research on long-term outcomes and interventional strategies is needed to establish treatment strategies for patients with false-positive stress echocardiography and to determine the underlying pathophysiology and outcomes of such results.

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