Stress echocardiography results in context

See page 1485 for the article to which this Editorial refers

Chest discomfort, which may or may not signify ischaemic heart disease, is extremely common. The prevalence and significance of ischaemic heart disease makes its recognition of paramount importance to physicians and patients alike. Even in the age of coronary intervention, a careful clinical history is acknowledged as the best way to recognize those with ischaemic heart disease. Talking to the patient is the best initial ‘screening test’, but physicians often use additional tests.

In this issue an experienced group of investigators from Aachen report their study of parameters derived from dobutamine stress echocardiography[1]. It is notable this study did not end the stress test on the basis of finding a single new wall motion abnormality. Deterioration of wall motion in more than three segments was required as one of the end-points. This study demonstrates that increased extent and severity of induced wall motion abnormalities during stress echocardiography result in higher positive predictive accuracy compared to less extensive or severe abnormalities. Specifically, deterioration in wall motion by one grade in a single segment gave a positive predictive value of 85% compared to angiographic findings. If the deterioration by one grade occurred in two or more segments the positive predictive value was 90% and it was 94% for three or four segments. Deterioration of wall motion by two grades in a single segment had a positive predictive value of 96%. The authors make the appropriate recommendation that ‘... the degree of positivity should be reported in clinical practice’[1].

Many laboratories now do this in an informal way; they present graphic representations of wall segments with each segment graded for normal motion, hypokinesis, akinesis, and dyskinesis. The study from Aachen is welcome as it formalizes and quantitates this practice. Additionally, however, the authors highlight some of the test parameters associated with reduced sensitivity or specificity. They suggest it is desirable to have the heart rate greater than 85% of the predicted maximal level. Interestingly, the use of atropine to achieve this goal occurred more often in those with a false-negative test results compared to those with true-positive result. Does this mean that atropine causes false-negative results? Patients with chronotropic incompetence, achieving less than 85% of the predicted maximum rate, are more likely to be missed because their threshold for ischaemia has not been reached[2]. Patients who do not respond ‘appropriately’ with increased heart rate may have more severe and complex abnormalities compared with those achieving higher heart rates for the same exercise or pharmacological stress[3]. The authors have not given much attention to the relatively recent observations that chronotropic incompetence per se is a predictor of more severe coronary ischaemia and also of all-cause mortality[4]. Thus it is important to recognize and give special attention to an inadequate heart rate response to stress.

While this article is extremely valuable, it is necessary to point out a few issues that are unavoidable. Several categories of patients were excluded including those with Q wave myocardial infarction, congestive heart failure, cardiomyopathy, and some other features. Thus, it is a set limited to those...
with chest pain or stable angina pectoris, including those with non-Q wave myocardial infarction. Seventy-eight percent of the population were men. Special consideration of this test is needed for women. Sixty-three of the 283 patients had prior angioplasty (n=43) and/or coronary artery bypass graft surgery (n=24). In all patients the ‘gold standard’ for the accuracy of the stress echocardiography was defined as at least 50% diameter stenosis of any main coronary artery branch by angiography. One must assume the authors could sort out how to interpret such a criterion in patients obviously having enough stenosis to warrant prior angioplasty or bypass surgery. The stress imaging tests have aggressively taught us not to put complete faith in the angiographic image. We have all had experience with an apparently severe angiographic stenosis with negative radionuclide and/or echocardiographic stress test. I believe the modern interpretation of this situation, in most cases, is that collateral circulation, or other factors, have led to an absence of myocardial ischaemia despite the apparent stenosis. Thus, a negative imaging stress test generally is of good prognostic significance even in the presence of angiographic stenosis.

Doubting the gold standard in Hoffmann’s study should not distract from the general principle that seeing a broad extent and severe degree of abnormality induced by stress means a greater certainty of ischaemia. However, we are still left with the dilemma of a marginally positive test. Specifically in echocardiography, the judgement that one segment has deteriorated by one grade as the result of stress (I would highlight that the authors have not included the absence of induced hyperkinesis as a criterion for a positive test.) I believe the biggest problem with imaging stress tests is in the group with borderline or minimal abnormalities. We appreciate that single-vessel coronary artery disease, as opposed to multi-vessel disease, is less frequently recognized with stress echocardiography than with radionuclide methods. The premise in the study by Hoffmann et al. should still be valuable in these patients. The interpreting physician and the patient’s physician both should weigh deterioration in wall motion by only one grade in only one segment differently from the stress-induced abnormalities of greater extent or severity.

The currently reported study has made me think a good deal more about how to convey to referring physicians and surgeons the results of our tests. In fact, we might alter our criteria of interpretation depending on the purpose of the test. Is it purely for diagnosis of the presence of coronary disease? Are we assessing the need for therapeutic intervention, or are we evaluating the effect of a previous intervention? In addition to the suggestions made in the currently reported article, one should give special attention to heart rate response to stress when interpreting the wall motion results. Laboratories often report stress tests as positive or negative for ischaemia without adequately describing how we came to that judgement. The article by Hoffmann et al. cautions us about this practice and reminds us to place our findings in the context of what actually was achieved during the test, as well as the reason for which the test was performed. Expanding the way stress echocardiography results are reported should further add to the value of this test in clinical medicine.

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References