Stress echocardiography. What is normal in old people?

Harald Becher*

John Radcliffe Hospital, Cardiac Investigation Annexe, Headley Way, Oxford OX3 9DU, UK

This editorial refers to ‘Real-time dobutamine stress myocardial perfusion echocardiography predicts outcome in the elderly’ by J.M. Tsutsui et al., on page 377

When we deal with the results of a diagnostic test such as stress echocardiography, we tend to be more interested in the abnormal results. However, in non-invasive imaging of coronary disease, calling a study falsely normal often causes more problems than a false-positive diagnosis, which can be corrected by consecutive tests. It is good clinical practice to finish cardiac assessment in those patients who have normal tests. However, how confident can we be in a normal stress echocardiogram? The answer to this question can only come from trials studying the outcome of many patients with normal stress echocardiograms. There are limited data in patients older than 70 years. Using standard stress echocardiography, Poldermans found an event rate of 7% during a relatively short follow-up period of 16 months. Tsutsui et al. have presented very reassuring data regarding the outcome of elderly patients with normal stress echocardiograms. The study involved a total of 470 patients, 215 of whom had normal studies. An advanced stress echo technique with ultrasound contrast agents was used and that is probably the reason for the excellent negative predictive value of the test.

Most laboratories performing stress echocardiography still rely on the qualitative assessment of changes in the regional left ventricular (LV) function. However, despite good training, the reproducibility between different readers remains a limitation of stress echocardiography. Doppler tissue imaging and strain imaging provide quantitative information of regional LV function. There was great hope of a more accurate assessment of normal and abnormal responses in stress echocardiography. However, Doppler tissue and strain recordings are influenced by multiple factors such as image quality, angle of the interrogation, position of the sample size, etc. Therefore, the American Society of Echocardiography did not recommend quantitative methods for stress echocardiography. According to the recently published guidelines the widespread use of quantitative methods will require further validation and simplification of analysis techniques.

There is not much left to improve the accuracy of stress echocardiography apart from administering contrast agents. Several echocardiographic societies advocate the use of ultrasound contrast agents for stress echocardiography. There is good evidence for improved endocardial border definition by contrast agents over native recordings: contrast agents increase the number of interpretable LV wall segments, improve the accuracy of less experienced readers, enhance the diagnostic confidence, and reduce the need for additional non-invasive tests. Therefore, contrast agents should be used when two or more segments are not well visualized.

However, contrast echocardiography is not just for improved endocardial border definition by LV opacification. An adequate LV opacification is inevitably associated with myocardial opacification—in particular when the newer contrast-specific imaging modalities are used. Assessment of myocardial opacification provides very important information on top of the evaluation of the wall motion. Questionable findings of wall motion can be clarified by assessing LV opacification, and vice versa. Homogeneous myocardial opacification and quick opacification of the myocardial vessels after LV opacification indicate normal myocardial perfusion and provide further confirmation of a normal wall motion study. This is particularly helpful in stress echocardiography. Reduced opacification in the subendocardial layers usually indicates reduced perfusion and often can be appreciated more easily and earlier than a new wall motion abnormality.

It was the assessment of myocardial perfusion which made the difference in the study of Tsutsui et al. Patients with normal wall motion and normal perfusion during stress had the best outcome, with an event rate of only 4% within 2 years. In contrast, patients with normal wall motion during stress but perfusion defects had an event rate of 16%. Myocardial perfusion imaging was the most significant predictor of adverse events, while wall motion was not an independent predictor of events. These results reflect the ischaemic cascade. In the case of a flow-limiting
coronary stenosis, stress-induced changes of perfusion precede the changes in LV wall motion. In addition, it appears to be a reasonable approach to use two parameters to judge myocardial ischaemia in order to increase the confidence of the test.

Implications for clinical practice

There are other methods for non-invasive imaging of coronary artery disease in old patients. These patients have frequent calcifications that make cardiac computed tomography (CT) unsuitable to identify patients who do not need further testing. Cardiac magnetic resonance imaging (MRI) is expensive, with very limited outcome data. In clinical practice, only myocardial scintigraphy is an alternative. However, scintigraphy alone would not be able to cope with the increasing demand to image an ageing population. Echocardiographic techniques appear more attractive as they are the most cost-effective alternative and avoid radiation.

Should we only trust the results of a contrast stress echocardiogram in patients older than 70 years? It is tempting regarding the number of the patients involved and the length of the follow-up in the study of Tsutsui et al. However, the study was performed in one expert centre only. Similar results were obtained in younger patients studied in the same centre. We need the outcome of more patients from different centres. Two multicentre studies on contrast echocardiography have been completed and we can expect outcome data from both studies at the end of 2008. In order to achieve figures similar to those available for nuclear imaging, the echocardiographic societies should consider a registry for contrast studies and matched non-contrast studies. This could also provide very quickly the figures which are needed for risk stratification in patients with different degrees of abnormal findings.

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References