Editorial

# Stress echocardiography: refining the diagnosis of coronary artery disease

Fausto J. Pinto

**Journal of Cardiovascular Medicine** 2006, **7**:000–000

Lisbon University, Portugal

Correspondence and requests for reprints to Fausto J. Pinto, MD, PhD, FACC, FESC, Director Cardiologia, Complexo Hospitalar das Torres de Lisboa, Rua Tomás da Fonseca-Torre F, 1600-209 Lisbon, Portugal
E-mail: fpinto@icvl.pt

AQ1 **Received** ?? ?? **Revised** ?? ??
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The diagnosis of ischemic heart disease, either in patients with suspected or in those with known coronary heart disease, represents one of the most important, frequent and challenging tasks in the every day echocardiography laboratory. Different ultrasound techniques have been developed over the last few years in order to refine its sensitivity and specificity. Stress echocardiography has emerged as one of the most frequently used methods. Different stress modalities have been described, such as exercise or pharmacologic stressors (dobutamine, dipiridamol, adenosine). Despite the high sensitivity and specificity of the method for the diagnosis of coronary artery disease, particularly in multi-vessel disease, there are several limitations associated with it, which have been identified and increasingly been overcome by the introduction of new ultrasound developments and refinements. At the same time we also improve the understanding of the pathophysiology underlying ischemic AQ2 heart disease. In this issue of the *Journal of Cardiovascular Medicine* three papers coming from different and prestigious schools of echocardiography in Italy describe some recent uses of new techniques associated with stress echo.

*Gentile and collaborators* discuss the use of contrast in stress echo, either as a method to enhance endocardial border definition (LVO, left ventricular opacification) or as a method to study myocardial perfusion (MCE, myocardial contrast echocardiography). The advantages and limitations of these methods are clearly described and the authors conclude that: 'the large number of data supplied by literature seems to support the use of contrast echocardiography in order to improve endocardial border imaging and for myocardial perfusion study during stress. However it is necessary that multicenter studies state definitively the choice of the best contrast agent and create protocols for MCE using different methods of image acquisition in order to unify the diagnostic process'. It is clear from the literature as well as from clinical practice that the use of contrast agents can improve the endocardial border definition, which is particularly relevant in patients with difficult windows due to several reasons. It has been more difficult to show unequivocally the role of myocardial contrast agents to assess myocardial perfusion in a consistent and reproducibly way that can be done routinely in every echo lab. Although some recent papers [1] start to demonstrate its potential role in clinical practice it is still premature to recommend it as a routine method. In fact, the learning curve associated with it, as well as the several technical details and some limitations that are not completely solved, make it a very promising tool but still with a need to show evidence-based data.

*Pio Caso and collaborators* describe the added value of using tissue velocities, including strain and strain rate, in stress echo and they conclude that: 'Doppler myocardial imaging, strain, and strain rate echocardiography provide additional information to conventional echocardiography. These techniques provide quantification of regional wall motion at rest and during stress... should be considered to be a sensitive alternative to the present echocardiographic and scintigraphic imaging techniques for stress tests... Further refinements in signal processing and quantitative analysis are likely in the near future.' This is also one of the areas that has had a substantial development in recent years. It is based on the assessment of myocardial velocities, which can be sampled in any myocardial segment, therefore providing immediate and quantified assessment of function, in a broad sense. In addition they overcame some of the limitations of, for instance, blood flow Doppler, providing a more reliable and less 'contaminated' signal. The ability to assess strain, which is a measurement of myocardial deformation, has also been shown both in the animal laboratory as well as in the echo lababoratory to be a very powerful tool to assess myocardial ischemia, improving the sensitivity and specificity of stress echo [2]. However, again, it still needs some technical improvements as well as user friendliness to become a widely used method.

*Rigo et al*. describe their experience in the assessment of coronary flow reserve by transthoracic echocardiography. As they state in their paper, the addition of coronary flow reserve to regional wall motion yields a highly specific (regional wall motion) and sensitive (coronary flow reserve) diagnostic marker, with an improvement in overall diagnostic accuracy. They also conclude that coronary

flow reserve evaluation favors vasodilator agents, instead of dobutamine and exercise and it also adds quantification to wall motion analysis, facilitating the communication of stress echo results to the non-expert, namely the clinician that has to make the clinical decisions, as has been recently shown [3]. This is also one method that needs both technical improvements as well as user friendliness to become a widely used method.

In conclusion, from this set of three well-written papers the reader can obtain a very good overview of what is currently being done in the field of stress echocardiography, and particularly the new techniques that have been applied. These have quite substantially improved the sensitivity and specificity of the method, therefore refining its use in the assessment and management of patients with suspected or already diagnosed coronary artery disease. However, we should always keep in mind that the clinical implementation of any method is much more complex than the enthusiasm of some seems to predict. The need for hard solid data with a clear demonstration of its clinical value is crucial for any method to overcome the test of time.

## References

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