



Introduction

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Contrast echocardiography is a fascinating field in which technology and clinical applications have been changing very fast during the last few years. During the 1990s several important advances were made. The method of contrast administration changed from intracoronary to intravenous, owing to the development of contrast agents able to reach the left cavities of the heart. This allows true non-invasive assessment of myocardial perfusion. In addition, non-linear imaging technologies have been developed in order to increase the amplitude of the returning signal corresponding to contrast agents. Real-time myocardial contrast echo (MCE) is now a reality. Therefore, contrast echo is now used routinely in echo labs to assess regional and global myocardial function, especially in patients with intermediate to poor acoustic windows. Presently, many echo labs around the world are already performing stress echo with combined evaluation of myocardial perfusion and contractile function.

The vast amount of information on contrast echocardiography that is already available justified the international symposium organized by Bracco during EUROECHO 7, held in Barcelona in 2003. This symposium reflects the opinion of experts and defines the "state of the art" of current knowledge.

To define the value of this technique within the context of the echocardiography lab, Natesa Pandian from Tufts University (New England Medical Center, Boston, USA) presented a full overview of the clinical value of contrast echocardiography. The author clarified the real value of contrast echocardiography in everyday work, explaining that in most laboratories ultrasound contrast agents are used in 10 to 15% of patients undergoing diagnostic studies. If contrast imaging was not used at least in some patients in a well-

organized echocardiography laboratory, it would constitute sub-optimal service.

Several echo labs around the world have started using contrast echo in a routine way to obtain better image quality and improve endocardial definition during stress echo studies.

Without any doubt, the assessment of myocardial perfusion has been, for decades, a "holy grail" in the evaluation of patients suffering from ischemic heart disease. Myocardial contrast echo still has some feasibility problems in patients with poor acoustic window, especially in the basal segments. However, image quality has improved in the last few years with the development of new contrast agents and technologies and will probably further improve in the future. Dr. Zamorano of the University Clinic, Madrid, reviewed the different applications of myocardial contrast echocardiography in coronary artery diseases, showing that the development of new contrast agents, such as SonoVue, allows the evaluation of patients with acute and chronic coronary syndromes and the assessment of myocardial viability and hibernating myocardium.

In most clinical reports on MCE perfusion, images are evaluated visually. This approach has several pitfalls, such as subjectivity of analysis and moderate intra- and inter-observer reproducibility. Moreover, it is difficult for the eye to evaluate the dynamic information provided by the rate of microcirculation replenishment, which is generally not taken into account. These limitations show the potential of quantitative analysis in this field. Luciano Agati and co-workers from the Cardiology Dept., La Sapienza, University of Rome, and Tonti's group at the Catholic University of Campobasso, have described the problems, limitations and future of quantitative methods.

In view of the importance of predicting func-

tion recovery after acute myocardial infarction, several new angiographic parameters have been introduced for improving the assessment of microcirculation integrity after primary percutaneous transluminal coronary angioplasty (PTCA). Dr Esther Pérez David from the Hospital General Universitario Gregorio Marañón, Madrid, compared the accuracy of angiographic methods versus quantitative myocardial contrast for predicting left ventricular recovery in acute myocardial infarction. The very important conclusion was that quantitative MCE analysis provides better information concerning ventricular function recovery during follow-up than final angiographic data. Taking these results into account, it is likely that this type of analysis will be widely used in the next years. A promising feature of these applications is parametric imaging, showing in image format the spatial distribution of perfusion-related parameters, similar to scintigraphy images. These tools

will be implemented for routine analysis of stress echo studies, thus allowing the analysis of changes in myocardial blood flow during stress.

This monographic issue of EJE describes how contrast echocardiography can play a very important role in the modern echocardiographic lab. However, future clinical applications of contrast echo will probably expand beyond: for instance, site-targeted microbubbles able to bind to specific markers of diseased tissue are being developed. This could allow non-invasive imaging of molecular and cellular processes. Therapeutic application of contrast agents, especially concerning drug and gene delivery, is currently a field of great interest. The future of therapeutic echocardiography is very promising and the field will see rapid advances in the coming years. All these fascinating areas of development open a new frontier in which contrast echo will play a key role in the diagnosis and care of our patients.