Editorial

Should contrast be routinely used for echocardiographic assessment of left ventricular function? A matter of appropriateness

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This editorial refers to 'Assessment of systolic left ventricular function. A multi-centre comparison of cineventriculography, cardiac magnetic resonance imaging, unenhanced and contrast enhanced echocardiography'† by R. Hoffmann et al., on page 607

Hoffmann et al.¹ present data showing that contrast-enhanced echocardiography, compared with unenhanced echocardiography, provides more accurate determination of left ventricular ejection fraction and significantly improves the correlation with cineventriculography and magnetic resonance imaging (MRI). Certainly, the most important question arising from this study is whether contrast injection should be routinely recommended for echocardiographic assessment of left ventricular function, as suggested by the study results. The authors did not discuss this question, nor did they state any clinical implications, thereby leaving the question open to public discussion. We would like to offer the following considerations.

Because most heart diseases affect the left ventricle, assessment of left ventricular volumes and function is of critical importance. Several diagnostic approaches have proved their usefulness for assessing left ventricular function, including cineventriculography, echocardiography, MRI, and radionuclide angiography. However, providing quantitative estimates of left ventricular volume, all these approaches have their limitations, and their accuracy and feasibility have been the subject of countless studies. Of the four approaches mentioned, echocardiography has become the most widely used diagnostic technique for assessment of left ventricular function, because of its unrivalled combination of cost effectiveness, clinical accessibility, accuracy, and tolerability. Cineventriculography, though the 'historic' clinical standard, is inherently limited by its invasive nature and suffers from significant inter-observer variability and limited reproducibility. MRI, in comparison, provides superior visualization of the left ventricle, making it a valuable clinical reference technique, but is yet unsuitable as a clinical standard because of its current limitations pertaining to accessibility, applicability to patients with pacemakers, and tolerability due to claustrophobia. Radionuclide angiography, though frequently used for reference in former studies, has never really challenged the other three approaches as a clinical standard because of its limited accessibility by cardiologists and limited applicability due to safety issues concerning the use of radioactive material.

A distinguishing feature of echocardiography, compared with the other three imaging modalities, is that echocardiography has undergone an evolutionary process of improvement and diversification since its clinical introduction in 1953.² Cineventriculography, MRI, and radionuclide angiography have only limited potential for technical improvement relevant to left ventricular analysis. Therefore, echocardiography has become the diagnostic imaging modality that provides the most information on left ventricular function. Beginning with limited 1D information from M-mode recording, echocardiographic analysis of left ventricular dimension and function became 2D in 1967 and 3D in 1992.³ Parallel to the inclusion of new dimensions, echocardiographic signal analysis was considerably extended to provide a broad range of information on left ventricular performance, including methods like tissue harmonic imaging, tissue Doppler, automated border detection, tissue tracking, and contrast application for left ventricular opacification.

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echocardiography compared with MRI (especially due to the severe underestimation of end-volumes and ejection fraction was significantly improved. In 120 patients where agreement on left ventricular MRI 4.6 ± 0.8 to other methods (unenhanced echocardiography vs. MRI enhanced echocardiography compared with unenhanced echocardiography, there is no reason to recommend its standard application. This, however, may change in future applications of echocardiography, when real-time 4D data sets will be acquired routinely within seconds and multi-parametric automated analysis of left ventricular function will be performed off-line. Within this scenario, routine application of contrast for improved automated border detection could be justified. Today, however, routine clinical application of echocardiography should be restricted by a careful selection of the appropriate methods, on an individual case basis, to keep echocardiography what it is—the most practical, effective, tolerable, and accessible diagnostic method for cardiac diseases.

References