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Heart failure is exceedingly prevalent in the United States and in other developed countries. Treatment regimens are complex and now include electrical therapy. Methods for evaluating left ventricular dyssynchrony using echocardiography rather than QRS duration have been developed, with tissue Doppler velocity parameters being the most popular. Real-time three-dimensional echocardiography is another novel method for dyssynchrony evaluation that has potential advantages over existing techniques. The authors describe their experience with three-dimensional echocardiography dyssynchrony evaluation and offer insights into the direction that this technology must move to improve results.

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Real-time three-dimensional echocardiography with its methodological advantage of rapid scanning of the complete left ventricle may be the optimal modality to overcome some limitations of conventional two-dimensional stress echocardiography. Matrix array transducers allow bi- or triplanar scanning or full-volume three-dimensional acquisition. Both techniques have been shown to significantly reduce scanning time without losing sensitivity and test accuracy, although here the emphasis is on bi- and triplane imaging. Several advantages of real-time three-dimensional stress testing during acquisition but also in the analysis and interpretation of echo data have been demonstrated over the last few years.

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Masaaki Takeuchi and Roberto M. Lang	

Two-dimensional stress echocardiography is an established technique for detecting the presence and severity of coronary artery disease. It also provides myocardial viability data, prognostic information, and risk stratification before major cardiovascular and noncardiac surgery. The current limitation of two-dimensional stress echocardiography includes the difficulty in obtaining the same imaging plane at rest and during stress, which may result in over- or underestimation of wall motion assessment, particularly in patients who have resting wall motion abnormalities. The accurate assessment of the extent and severity of stress-induced wall motion abnormalities is often difficult, and wall motion abnormalities may be missed by visual inspection of wall motion from the standard two-dimensional views. Recent technological development and engineering refinements have allowed the application of real-time three-dimensional (RT3D) echocardiography in the routine clinical setting. Because full-volume datasets obtained with RT3D echocardiography incorporate information on the entire left ventricle in four volumetric datasets, RT3D stress echocardiography has the potential to overcome many of the limitations encountered with two-dimensional stress echocardiography. Two different types of imaging modes, full-volume and multiplane mode, can be used to acquire and analyze stress echocardiography. Both modes have their particular benefits and limitations. This article reviews the literature describing the clinical utility of RT3D stress echocardiography, with particular emphasis on full-volume datasets.

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