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Myocardial Strain and Strain Rate Imaging: Comparison between Doppler Derived Strain Imaging and Speckle Tracking Echocardiography

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Regional myocardial function has been traditionally assessed by visual estimation (1). Echocardiographic strain imaging which is known as deformation imaging, has been emerged as a quantitative technique to accurately estimate regional myocardial function and contractility. Currently, strain imaging has been regarded as a research tool in the most echocardiography laboratories. However, in recent years, strain imaging has gain momentum in daily clinical practice (2). The following two techniques have dominated the research arena of echocardiography: (1) Doppler based tissue velocity measurements, frequently referred to tissue Doppler or myocardial Doppler, and (2) speckle tracking on the basis of displacement measurements (3). Over the past two decades, Tissue Doppler Imaging (TDI) and Doppler –derived strain (S) and strain rate (SR) imaging were introduced to quantify regional myocardial function. However, Doppler–derived strain variables faced criticisms, with regard to the angle dependency, noise interference, and substantial intraobserver and interobserver variability. The angle dependency is the major weakness of Doppler based methodology; however, it has the advantage of online measurements of velocities and time intervals with excellent temporal resolution, which is essential for the assessment of ischemia (4). Speckle-tracking echocardiography (STE) or Non Doppler 2D strain echocardiography is a relatively new, largely angle-independent technique that analyzes motion by tracking natural acoustic reflections and interference patterns within an ultrasonic window. The image-processing algorithm tracks elements with approximately 20 to 40 pixels containing stable patterns and are described as "speckles" or "fingerprints". The speckles seen in grayscale B-mode (2D) images are tracked consecutively frame to frame (5, 6). Assessment of 2D strain by STE is a semiautomatic method that requires definition of the myocardium. Consequently suboptimal tracking of the endocardial border may be a problem with STE. Assessment of 2D strain by STE has been applied to both ventricles and atria. The articles published in this issue of the journal demonstrate the value of Strain and strain rate imaging in detecting the subclinical atrial and ventricular dysfunction, besides reporting the normal value of right atrium deformation indices. In all, first three articles of this journal, measurement of ventricular and atrial deformation indices have been considered as a feasible and reproducible technique. Assessment of atrial deformation profiles using Doppler-derived strain imaging and STE has been recently proposed as an alternative method of exploring atrial function (7). Nonetheless, some potential technical difficulties are noteworthy. STE is not completely angle independent, since ultrasound images normally have better resolution along the ultrasound beam compared with the perpendicular direction. Newly developed three-dimensional speckle tracking (3DT) method has been suggested as a simple, feasible, and reproducible method to measure longitudinal, circumferential and radial strains. Similar to other 2D imaging techniques, 3DT relies on good image quality and the major pitfall of 3D STE is its dependency on image quality. Nevertheless, it still requires rigorous validation and testing (8-10).

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