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EDITORIAL COMMENT

Strain and strain rate imaging: a promising tool for evaluation of ventricular function

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Prognosis in patients with heart failure is inversely related to the remaining left ventricular function. Decrease of systolic function is mostly uniform in idiopathic myopathies. However, frequently impairment of left ventricular function is not global but regional. The extent of regional systolic dysfunction may be assessed quantitatively or qualitatively. Although many non-invasive methods have been developed for evaluation of myocardial function, some methods are hampered by being subjective and only partially quantitative and have been shown to be subjective and experience dependent [1]. Non invasive imaging of left and right ventricular function can be done with radionuclide ventriculography, 2D echocardiography, 3D echocardiography, contrast echocardiography, both 2D and 3D gated single photon emission tomography, cardiovascular magnetic resonance imaging and computed tomography. Recently tissue Doppler myocardial imaging, color Doppler myocardial imaging and 2D speckle tracking have been developed. These techniques use the frequency shifts of ultrasound waves to calculate myocardial velocity. Color flow imaging takes the pulsed-wave Doppler frequency shift over a set of range gates and a number of acoustic lines. With this technique, fractional change in length of a part of the myocardium compared to its original length, or strain, can be measured [2]. Because strain reflects deformation of the myocardium, strain directly describes the contraction/relaxation pattern. Strain can be calculated in several dimensions; longitudinal, circumferential, or radial. Strain rate describes the rate of deformation. Speckle tracking is based on the fact, that reflected ultrasound from tissue is the result of interference by numerous reflected wavelets. The result is an in an interference pattern, which remains relatively constant for any small region in the myocardium, called speckle. In speckle tracking, similar speckles from one frame to the other are compared [3]. The paper from Pavlopoulos and Nihoyannopoulos gives us a perfect overview of the physics and the technological background of tissue Doppler imaging, color Doppler myocardial imaging and speckle tracking. These new techniques can be used to accurately and reproducibly measure global right and left ventricular function and regional wall deformation [4, 5]. Next to this, these techniques can be used as a robust technique to determine diastolic dysfunction and cardiac dyssynchrony [6, 7]. At this moment, Tissue Doppler Imaging is one of the most promising techniques for guiding patient selection for cardiac resynchronization therapy [8, 9]. Additionally Tissue Doppler Imaging can have a role in detecting cardiac ischemia and myocardial viability during stress echocardiography in patients with coronary artery disease and left ventricular dysfunction [10,

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11]. Doppler myocardial imaging is also a very sensitive marker of sub-endocardial dysfunction. Measurement of myocardial velocities can discriminate between physiological and pathological hypertrophy and can be used to monitor regression of left ventricular hypertrophy under pharmacological treatment [12].

In general Tissue Doppler Imaging, Strain Rate Imaging and Speckle Tracing will gain increased importance in regular clinical cardiology within short time. Therefore every imaging cardiologist has to improve his or her knowledge and the opportunities of this technique. The current paper Pavlopoulos and Nihoyannopoulos can be a start for a complete understanding of the background and physics of this challenging imaging technique!

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