Doppler Strain Rate Echocardiography Versus Magnetic Resonance Imaging

To the Editor:

In the recently published article by Edvardsen et al in Circulation where Doppler strain rate (SDE) was compared with magnetic resonance imaging (MRI) tissue-tagged strain rate imaging, it is a significant loss for the readers that the differences in strains obtained from MRI and SDE were glossed over so casually by the authors.

As stated in the article, strain is the time integral of incremental strain rate. One assumes SDE performs this time integral for a small area on the echocardiographic image, with various sections of heart tissue moving through that small area during the heart cycle (ie, Doppler imaging cannot yet “track” tissue through the heart cycle), whereas MRI performs this time integral between “fixed” sections of heart tissue moving away or toward one another.

One analogy of SDE is that of observing a small area of a river from the banks of the river (Eulerian method of description) versus MRI, which is more akin to observing a small area of river while floating on the river (Lagrangian method of description).2

Even if “the limits of agreement between the techniques were relatively small,” the 2 techniques are not measuring the same variable. If the 2 variables have a consistent relationship, as shown nicely in this study, then it should be stated as such.

Curt DeGroff, MD
Assistant Professor - Pediatric Cardiology
The Children’s Hospital
University of Colorado - Health Science Center
1056 E. 19th Ave, B-100
Denver, Colorado 80218
degroff.curt@tchden.org


Response

The comment from Dr DeGroff on our recently published article1 relates to the fundamental difference between measuring strain by Doppler echocardiography, where measurements are taken from a fixed point in space, and measuring strain by tagged magnetic resonance imaging (MRI), where measurements are taken from a fixed piece of myocardium. The latter technique gives a more accurate strain estimate for one particular myocardial region. Strain by Doppler echocardiography is limited to a 1-dimensional space, and one cannot correct for through-plane motion effects. Furthermore, strain by Doppler is dependent on the angle between the direction of the Doppler beam and that of tissue deformation.

Despite these limitations, Doppler echocardiography provides strains that approximate those measured by sonomicrometry2,3 and tagged MRI.1 Therefore, strain by Doppler, which can easily be implemented as a bedside method, may have significant clinical potential.

Otto A. Smiseth, MD, PhD
Thor Edvardsen, MD
Department of Cardiology
Rikshospitalet University Hospital
Oslo, Norway
Bernhard L. Gerber, MD, PhD
Jérôme Garot, MD
David A. Bluemke, MD, PhD
João A.C. Lima, MD
Division of Cardiology
Johns Hopkins Hospital
Baltimore, Md

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Curt DeGroff

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