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EDITORIAL COMMENT

Speckle tracking: distinction of physiologic from pathologic LVH?

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Over the past years, echocardiography and magnetic resonance imaging (MRI) have become important imaging modalities in patients with a broad spectrum of cardiomyopathies [1–20]. Both imaging modalities have been shown to play a pivotal role in the accurate evaluation of left ventricular function particularly in patients with ischemic heart disease and different forms of cardiomyopathy [21–36]. These methods are needed to accurately identify and characterize patients with various manifestations of left ventricular hypertrophy (LVH) [37–49]. The important question should be resolved whether training-induced LVH in athletes is a physiological rather than a pathophysiological phenomenon [50–57]. In a meta-analysis using MRI, involving 59 studies and 1,451 athletes (both endurance-trained and strength-trained athletes), it was reported that the athlete's heart demonstrated normal systolic and diastolic cardiac function, implying that training-induced LVH in athletes is predominantly a physiological phenomenon [58]. With respect to echocardiography, two-dimensional strain has become a novel method to measure strain from standard two-dimensional echocardiographic images by speckle tracking. Speckle tracking offers the advantage of being less angle-dependent and more reproducible than conventional Doppler-derived strain [59–61]. This echocardiographic imaging technique allows quantification of global and regional myocardial deformation on the basis of tracking of acoustic markers from frame-to-frame.

In the current issue of the *International Journal of Cardiovascular Imaging*, Butz et al. [62] questioned whether two-dimensional strain assessed by speckle tracking was useful as an additional tool in differentiating pathologic from physiologic LVH in high-level athletes. The objective of the study was to identify and characterize global and regional function abnormalities in patients with pathological left ventricular hypertrophy (LVH) caused by non-obstructive hypertrophic cardiomyopathy (HCM), in high-level athletes, and in healthy controls. The authors consecutively studied 53 subjects consisting of 15 patients with HCM and 20 competitive top-level athletes. A control group of 18 sedentary normal subjects was studied by standard echocardiography according to standard guidelines. Global longitudinal strain and regional peak systolic strain were assessed by two-dimensional strain in the apical four-chamber view. It turned out that all components of strain were significantly reduced in patients with HCM when compared to athletes and control subjects. There was no significant difference between the strain values of the athletes and the control group, but in some segments the strain

Editorial comment to the article of Butz et al. (10.1007/s10554-010-9665-5).

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values of the control group were significantly higher than those in the athletes. A cut-off value of global longitudinal strain less than −10% for the diagnosis of HCM resulted in a sensitivity of 80% and a specificity of 95%. The combination of tissue Doppler imaging (averaged S′, E′) and global longitudinal strain cut-off values for the detection of pathologic LVH in HCM demonstrated a sensitivity of 100% and a specificity of 95%. The authors concluded that speckle tracking is a new simple and rapid method to measure global longitudinal strain and peak systolic strain as components of systolic strain.

This novel and very interesting technique offers a unique approach to quantify global as well as regional systolic dysfunction, and might be used as new additional tool for the differentiation between physiologic and pathologic LVH. The present study is one of the first that used the combined and comprehensive tissue Doppler imaging analysis of systolic and early diastolic velocities of the lateral and septal mitral annulus as well as two-dimensional strain analysis for the differentiation between pathologic and physiologic LVH. The main results of this intriguing study show that global strain is significantly reduced in patients with HCM and that strain measurements can therefore be used for differentiation between pathologic and physiologic LVH. Especially, the combination of tissue Doppler imaging and two-dimensional strain assessment allows the differentiation of pathologic and physiologic LVH with acceptable sensitivity and specificity. This differentiation is extremely important in terms of clinical well-being, treatment and prognosis. In physiologic hypertrophy, such as in athletes, LVH reveals normal circumferential, radial, and longitudinal profiles possibly indicating that myocardial strain imaging might be useful as additional echocardiographic modality for the differentiation between athlete's heart and HCM. In pathologic hypertrophy, LVH appears to be associated with subendocardial fibrosis, which might be a potential mechanism for the failure of the hypertrophied myocardium in due time. In another study by the same group [63], peak systolic longitudinal strain of the basal septum and the opposite lateral wall was measured in addition to standard echocardiography in 88 consecutive patients with obstructive HCM who underwent a septal ablation procedure. Regional myocardial deformation was assessed quantitatively by speckle tracking. During a 12-month observation period, no patient had a severe adverse event. Reduction of left ventricular afterload by elimination of the outflow gradient following a successful septal ablation procedure resulted in improvement of systolic lateral longitudinal function in patients with obstructive HCM.

To summarize, two-dimensional strain analysis by echocardiography is a new simple, rapid, and reproducible method to measure systolic strain. Echocardiographic speckle tracking allows accurate quantitative assessment of regional myocardial deformation. As a result, the speckle tracking technique can be used as additional tool for (1) a comprehensive cardiac evaluation in subjects with physiologic hypertrophy versus pathologic hypertrophy, and (2) an appropriate assessment of the effects of therapy in patients with pathologic LVH.

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