ACC.12
61st Annual Scientific Session & Expo
ACC-i2 with TCT innovation in intervention

E1126
JACC March 27, 2012
Volume 59, Issue 13

Imaging

A NOVEL TECHNIQUE TO MEASURE DIASTOLIC FUNCTION USING A PROTOTYPE SPECKLE TRACKING ECHOCARDIOGRAPHY SYSTEM: RESULTS FROM THE RADIOFREQUENCY-BASED SPECKLE TRACKING ECHOCARDIOGRAPHY TO EVALUATE DIASTOLIC FUNCTION (RF-SPEED) STUDY

ACC Moderated Poster Contributions
McCormick Place South, Hall A
Saturday, March 24, 2012, 9:30 a.m.-10:30 a.m.

Session Title: Imaging: Echo Diastology
Abstract Category: 22. Imaging: Echo
Presentation Number: 1095-192

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Background: Strain rate imaging using speckle tracking echocardiography (STE) may provide a more straightforward and accurate assessment of diastolic function than conventional parameters. Current commercial systems, however, are limited in their ability to accurately measure strain rate because of low frame rates (< 100 frames/sec) and noisy curves. In contrast, we have developed a new technique using a prototype radiofrequency(RF)-based STE system that can perform speckle tracking at very high frame rates (≥ 200 frames/sec), allowing accurate measurement of diastolic circumferential strain rate during isovolumic relaxation (DCSR-IVR), the time period when active relaxation of the LV occurs.

Methods: 50 patients prospectively underwent echocardiography using the prototype system and a commercial system immediately prior to cardiac catheterization. Diastolic function was graded based on the mitral inflow pattern and catheter-derived measurement of LV end-diastolic pressure, which was used to distinguish normal from pseudonormal patterns. Global DCSR-IVR was measured from the parasternal long axis view by tracking 2 regions of interest in the anteroseptum and the posterior wall to produce trans-ventricular strain rate curves, which based on geometric calculations, are equal to circumferential strain rate.

Results: 27 patients had adequate image quality for RF-based STE. Of these, 26% had normal diastolic function, 44% had Grade 1 diastolic dysfunction, 26% had Grade 2 diastolic dysfunction (pseudonormal), and 1 patient had indeterminate diastolic function. Patients with Grade 1 diastolic dysfunction had significantly lower DCSR-IVR compared to those with normal diastolic function (0.37 ± 0.19 vs 0.61 ± 0.21 sec-1; p = 0.023), as did those with Grade 2 diastolic dysfunction (0.34 ± 0.12 vs 0.61 ± 0.21 sec-1; p = 0.013). A global DCSR-IVR < 0.45 sec-1 had a sensitivity of 68% and a specificity of 86% for prediction of diastolic dysfunction (ROC area under the curve = 0.823; p = 0.013).

Conclusion: RF-based STE using the new prototype can be used to assess DCSR-IVR, a novel measure of diastolic function. This new technique may allow for better diagnosis of diastolic dysfunction in the future.