ACC.13
62nd Annual Scientific Session & Expo
TCT@ACC-i2

E906
JACC March 12, 2013
Volume 61, Issue 10

Imaging

EVALUATING CARDIAC MECHANICS FROM 4D ECHOCARDIOGRAPHIC IMAGING FOR LONGITUDINAL AND CIRCUMFERENTIAL STRAIN USING 3D-WALL MOTION TRACKING

Moderated Poster Contributions
Poster Sessions, Expo North
Saturday, March 09, 2013, 3:45 p.m.-4:30 p.m.

Session Title: Imaging: 3D Echocardiography
Abstract Category: 18. Imaging: Echo
Presentation Number: 1180M-337

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Background: Circumferential and longitudinal strain (CS,LS) are both important indicators of myocardial function. Prior 2D echo research has verified speckle tracking to assess cardiac mechanics despite lost information from "out of plane motion." This study evaluated strain determination by a novel 4D echo image-based 3D Wall Motion Tracking (3D-WMT) program.

Methods: A pulsatile pump apparatus was used to drive each phantom heart model with constant rotation (5°) and compaction (10 mm) to simulate physiological cardiac motion. Stroke volumes of 30-70 ml in 10 ml increments were used. A latex balloon was sutured into the LV of 5 fresh pig hearts. The hearts were affixed to a rotating plate at the base and lightly fixed at the apex. The model was submerged in a water tank and imaged with the Toshiba matrix array PST-25SX 2.5-MHz transducer. Three sono crystals were sutured into the myocardium adjacent to the LAD. The full volume data was analyzed by 3D-WMT focusing on the mid anterior segment.

Results: Linear regression analysis suggest a strong correlation between sono data and 3D-WMT derived strain values, with high correlation coefficients for both CS (R^2 = .76) and LS (R^2 =.79), P < .001. Bland-Altman analyses revealed 96% of the data points were within the 95% CI as well as a consistent overestimation.

Conclusion: The results suggest that Toshiba 3D-WMT can accurately measure CS and LS despite overestimation.