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Non Invasive Imaging (Echocardiography, Nuclear, PET, MR and CT)

FEASIBILITY OF 4D ECHOCARDIOGRAPHY FOR EVALUATION OF RIGHT VENTRICULAR MECHANICS: VALIDATION AGAINST SONOMICROMETRY

Poster Contributions
Poster Hall B1
Sunday, March 15, 2015, 9:45 a.m.-10:30 a.m.

Session Title: Non Invasive Imaging: Strain Imaging by Echocardiography
Abstract Category: 17. Non Invasive Imaging: Echo
Presentation Number: 1174-043

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Background: This study tested the feasibility of 4D echocardiography to evaluate right ventricular (RV) strain mechanics using both vendor-dependent and vendor-independent analysis packages.

Methods: Ten freshly harvested porcine hearts were studied in a water bath with three sonomicrometry (sono) crystals sutured in a triangular formation onto the mid-anterior segment of the RV free wall to monitor longitudinal and circumferential strain (LS, CS). Custom-made latex balloons were sutured into the RV and connected to a pulsatile pump apparatus to produce wall motion. Each heart was studied at stroke volumes (SV) 20 to 60 mL. 4D images were obtained with a GE Vivid E9 ultrasound system at a frame rate of 49.2 fps and analyzed through vendor-dependent software EchoPAC 4DLVQ and vendor-independent software TomTec ImageArena. Sono data was obtained using a SonoMetrics system and analyzed by SonoView software.

Results: Linear regression analyses for 4D echocardiography and sonomicrometry demonstrated excellent correlations for both EchoPAC (LS: R = 0.90219; CS: R = 0.76757; both p<0.005) and TomTec (LS: R = 0.80750; CS: R = 0.73591; both p<0.005) strain values. Bland-Altman analyses demonstrated greater overestimation in TomTec (LS: Bias = 11.158, 96%LOA; CS: Bias = 6.491, 100%LOA) than EchoPAC (LS: Bias = 2.273, 98%LOA; CS: Bias = 6.772, 96%LOA).

Conclusion: Both EchoPAC and TomTec programs are useful and accurate for determining RV segmental strain with 4D echocardiography.