AbstractID: 1215 Title: Measurements and Computer Simulations of the Anisotropy of Ultrasonic Backscatter in Parasternal Short-Axis Echocardiographic Images of Mice

OBJECTIVE: The objective of this investigation was to measure the anisotropy of backscattered ultrasound observed in the parasternal short-axis view of mouse hearts and to compare these measured values with the predictions of a computer simulation. METHODS: Echocardiographic images of the heart were obtained from 7 wild-type mice using a clinical imaging system with a nominal 13 MHz linear array. Measurements of the inherent anisotropy of mid-myocardial backscatter arising from the angle of insonification relative to the local fiber orientation in the short-axis view were obtained for end-systolic images. Furthermore, a computer model simulating the short-axis view was implemented based on previously measured (in vitro) values for the anisotropy of backscatter and attenuation in myocardium. RESULTS: The mean measured backscatter values were greatest for those regions corresponding to approximately perpendicular insonification relative to the myofibers and the least for regions of approximately parallel insonification with the minimum to maximum values of backscattered ultrasound differing by approximately 10dB. These measured results are in relatively good agreement with the predicted anisotropy obtained from the computer simulation of the short-axis view. CONCLUSION: These results show that the backscatter value varies with position in a manner consistent with the ultrasonic path lengths and the inherent myocardial anisotropy of ultrasonic attenuation and backscatter encountered. This study represents a first step toward extending anisotropy of backscatter measurements to the study of genetically manipulated mouse models of specific cardiac diseases as an approach for providing new insights into the disease-altered properties of the myocardium. [NIH R37 HL40302]