A VALIDATION OF THE ABILITY OF MAGNETIC RESONANCE IMAGING TO MEASURE BLOOD FLOW IN CANINE CORONARY ARTERIES

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Coronary artery disease contiues to be the leading cause of death for adults in the United States. Magnetic resonance imaging (MR) has the potential to dramatically impact the diagnosis of heart disease by providing a wide range of anatomical and physiologic information with a non-invasive method. One component of a complete cardiac exam would be flow measurements within the coronary arteries.

Phase contrast magnetic resonance imaging can measure blood flow accurately in large vessels. The small size of the coronary arteries and their continual movement create a challenging environment for successfully measuring blood flow. None-the-less, previous research has shown that with data segmentation techniques and cardiac gating, flow values can be accurately measured in the left anterior descending artery in vivo with MR.

The current work validates MR flow measurements in canine circumflex arteries using transit time ultrasound as a standard. The circumflex artery experiences greater in- plane motion than the left anterior descending artery, and is, therefore, a more stringent test for flow measurent accuracy. This work also compares two methods of processing MR velocity data, and examines the sources of error present in the animal validation model. The MR techniques all show a high degree of correlation to the ultrasound standard (r values > 0.9), but have scattered levels of agreement (slopes = 0.73 - 1.04 MR/US). The reasons for the discrepancies are shown to stem from a number of possible sources including variability of the ultrasound standard, low signal-to-noise ratios in the MR images, sensitivity of the MR technique on vessel identification, and motion artifacts in the images.