AbstractID: 9426 Title: Low dose myocardial CT perfusion measurements using Prior Image Constrained Compressed Sensing (PICCS)

Purpose: To describe a method of low dose CT myocardial perfusion imaging based on an angularly under-sampled projection acquisition and PICCS image reconstruction, and evaluate its performance in a preliminary porcine study.

Method and Materials: Recently an extension to compressed sensing has been proposed in which a prior image is utilized as a constraint in the image reconstruction (i.e. Prior Image Constrained Compressed Sensing - PICCS). In this case the prior image is reconstructed with a short scan about 3 seconds before contrast arrives. Using the PICCS algorithm significant under-sampling of the subsequent time frames is feasible, which would yield a direct dose savings if a pulsed x-ray tube is used. In order to demonstrate the potential dose savings, a contrast enhanced porcine scan was performed on a 64 slice MDCT system.

Results: Three regions-of-interest were identified in the myocardium adjacent to the left ventricle. The ability of the under-sampled PICCS acquisitions to portray the temporal enhancement dynamics seen in full-dose, fully-sampled dynamic CT imaging was assessed by comparing quantitative perfusion parameters derived from time-density curves. For dose reduction factors from 4.3 to 12.8, the average error in the time to peak ranged from -3% to 2.5%, and the average error in upslope parameter ranged from -14% to 7.5%.

Conclusion: The results of a single porcine study indicate the potential for significant dose reduction (e.g. an order of magnitude) using a gated pulsed acquisition with respect to myocardial perfusion measurements.