

AbstractID: 5269 Title: Performance of CT and MR-based Assays for In Vivo Agent Concentration Quantitation

Purpose: To investigate the feasibility of performing longitudinal image-based measurements using CT and MR to estimate contrast agent concentrations in organs and tissues *in vivo*.

Method and Materials: A CT and MR contrast agent (200 mg/kg of iodine and 16 mg/kg of gadolinium encapsulated in liposomes) was administered intravenously to a 2 kg New Zealand White rabbit. At 5 minutes, 24, 48, 72, 96, 120 and 168 hours following contrast injection, the rabbit was imaged in CT (120kV, 200mA) and in MR (3D FSPGR, TR/TE= 9.8/4.3). 1mL of blood was collected from the same rabbit at each of the above times. The rabbit liver and spleen were harvested at the study end point (168 hours). The blood and tissues samples were then analyzed using high performance liquid chromatography (HPLC) to measure iodine content and inductively coupled plasma atomic emission spectrometry (ICP-AES) to measure gadolinium content.

Results: The differential blood CT attenuation vs. plasma iodine concentration correlation was well approximated with a linear fit ($R^2=0.9$), while the differential blood MR signal intensity vs. plasma gadolinium concentration correlation was found to be nonlinear. These correlations were used to estimate the iodine and gadolinium content in the liver and the spleen. Using the CT correlation, the liver and the spleen iodine content were estimated to be 70% and 60% of the extracted amounts, respectively. The MR-based method did not yield satisfactory gadolinium content estimates.

Conclusion: This study attempted to correlate CT attenuation and MR signal increases to local iodine and gadolinium concentrations, respectively. In CT, the linear correlation obtained with blood data allowed for estimation of iodine content in the liver and spleen to 60-70% accuracy. In MR, although the presence of the contrast agent could be detected visually over a 7-day period, additional effort is required to achieve reliable agent concentration estimations.