AbstractID: 5674 Title: A New Arterial Input Free Method of Deconvolution in Functional CT

Purpose: In functional CT (fCT), the arterial input function (AIF) and tissue curve are measured and used for calculating the functional parameters by deconvolution. A new method of deconvolution without the requirement of AIF is presented.

Method and Materials: The AIF is determined by the injection profile (IF) and the dispersion due to the patient's physiology (i.e. "patient function", PF). Eight patients with cervix carcinoma participated in a fCT study, in which X-ray contrast of 1.5ml/kg was injected at 4ml/sec. At the same time, a cine CT set was performed at a fixed slice at 1 rotation/sec for 120 sec. The AIFs are obtained from the CT scans and the PFs were determined by deconvolution of IF from AIF. The characteristics of PF were quantified and correlated with the patients' weight. The proposed method incorporates IF and PF into the deconvolution for the determination of functional parameters, as IF is known while PF can be partially determined in a population of patients. The method makes use of the strong correlation between PF and weight as constraint for deconvolution. The adiabatic tissue homogeneity model was examined. Functional parameters calculated with the conventional and new approach were compared.

Results: The correlation coefficients of the maximum amplitude, peak-to-peak time, and amplitudes at 80 and 100 sec of PE, when correlated with patients' weight, were found to be -0.84, 0.45, -0.97 and -0.98 respectively. The spreads of the differences in blood flow, mean transit time, extraction fraction, and extravascular volume between the two methods were 2.83, 3.3, 6.29, and 6.45 % respectively. The mean differences of functional parameters between these two methods were <1 % except for extraction fraction (7 %).

Conclusion: This study showed the feasibility to extract the patient function and incorporating it in deconvolution for fCT without the requirement of AIF.