AbstractID: 9487 Title: The Role of Voxel-Based T10 Calculations in Determining Correct Pharmacokinetic Parameters for Head and Neck Tumors

Purpose: To determine the optimal flip angle combination (oFAc) that generates voxel-based T10 values, the median T10 for primary and nodes (T10^p,n), and its implications on vascular permeability (PERM) and extracellular volume fraction (EVF) in HN patients treated with targeted therapy and chemoradiation.

Method and Materials: To generate voxel-based T10, a gradient echo sequence was used on a 1.5 T scanner with TR=6.44 msec and FA of 10, 15, 20, 30, 45°. For different FA combinations, the voxel-based values were calculated using CAD Sciences® (White Plains, NY). The average of the median T10 in muscle and fat (T10^m,f) regions of interest (ROI) in 3 patients was calculated. Criteria for oFAc included minimal variation from published muscle and fat values at 1.5T, and minimum number of FA used for fitting. To determine T10^p,n, values from ROIs delineated by 2 users (A,B) were calculated. For 3 patients, the PERM and EVF from primary and nodes ROIs were calculated using T10 maps and T10^m,f.

Results: The 10-45° oFAc was chosen for subsequent T10 mapping as it had the greatest percentage of fitted pixels (90% for muscle, 100% for fat, % 83 for primary, 72% for nodes) and a T10^m = 0.923 sec, and T10^f = 0.379 sec, compared to reported 0.870 and 0.260 sec for muscle and fat, respectively. From 14 patients, T10^p_A = 0.804, T10^n_A = 0.760, T10^p_B = 0.849, T10^n_B = 0.810 sec. The difference between the PERM and EVF calculated with voxel-based T10 versus T10^p,n ranged from 6-81% for PERM, and 2.5-23% for EVF.

Conclusion. The 10-45° oFAc is fast and accurately describes the known T10 of normal tissue. Voxel-based T10 calculations are essential for correct Tofts-based PA in heterogeneous tumors. For HN, primary and nodes T10^p,n = 0.8 sec is a good estimate for T10 in the absence of T10 mapping capability.