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 T_{10} values, the median T_{10} for primary and nodes ($T_{10}^{p,n}$), 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 T_{10}, 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 T_{10} in muscle and fat ($T_{10}^{m,f}$) 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 $T_{10}^{p,n}$, 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 T_{10} maps and $T_{10}^{p,n}$.

Results: The 10-45° FAc was chosen for subsequent T_{10} mapping as it had the greatest percentage of fitted pixels (90% for muscle, 100% for fat, % 83 for primary, 72% for nodes) and a T_{10}^{m} = 0.923 sec, and T_{10}^{f}=0.379 sec, compared to reported 0.870 and 0.260 sec for muscle and fat, respectively. From14 patients, T_{10}^{pA} = 0.804, T_{10}^{nA} = 0.760, T_{10}^{pB} = 0.849, T_{10}^{nB} = 0.810 sec. The difference between the PERM and EVF calculated with voxel-based T_{10} versus $T_{10}^{p,n}$ ranged from 6-81% for PERM, and 2.5-23% for EVF.

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