

AbstractID: 12941 Title: Correlation of PET images of metabolism, proliferation and hypoxia to characterize tumor phenotype in patients with HNSCC

Purpose: As positron emission tomography gains increasing prominence in tumor staging, radiotherapy target definition, and treatment assessment, better descriptions of tumor physiology are desired. In order to establish interrelation between tumor phenotypes, we have correlated PET images of metabolism, proliferation, and hypoxia in patients with head and neck squamous cell carcinoma (HNSCC).

Method and Materials: PET/CT images of patients with HNSCC were acquired using [¹⁸F]FDG (a surrogate of metabolism), [¹⁸F]FLT (proliferation), and [⁶⁴Cu]CuATSM (hypoxia). Patients were immobilized with thermoplastic head masks. Images were coregistered via bony anatomy and normalized to SUV. For each patient, ROIs were drawn on PET images over primary tumors ($n=8$) and nodal volumes ($n=7$). Correlation coefficients between FDG, FLT, and CuATSM distributions were calculated 1) at the voxel level, by comparing image values and 2) at the ROI level, by comparing mean SUV.

Results: When comparing primary tumors at the voxel level, highest correlation coefficients were observed between FLT and FDG uptake. FDG:FLT on average had $R=0.77$ [range 0.52—0.89] compared to $R=0.54$ for FDG:CuATSM [range 0.09—0.79] and $R=0.49$ for FLT:CuATSM [range -0.02—0.76]. Nodal volumes showed similar trends. When comparing tumors at the ROI level, correlations were low ($R<0.35$) for all primary volumes and all nodal volumes except for FDG:CuATSM ($R=0.72$).

Conclusion: FDG:FLT had the highest degree of correlation at the voxel level, while FLT:CuATSM and FDG:CuATSM exhibited high variability between patients. Voxel-based regression of imaging surrogates may represent a superior technique to ROI-based regression, which lacks spatial information, and is a valuable first step in the implementation of spatial correlation for tumor staging, radiotherapy target definition, or treatment assessment.

Conflict of Interest (only if applicable): Research sponsored in part by Genentech.