

AbstractID: 14304 Title: Impact of different SUV measures on PET-based treatment response assessment

Purpose: PET-based treatment response assessment typically uses the change in SUV to quantify response. However, different SUV measures could result in different quantifications of response. We investigated the impact of different SUV measures on treatment response assessment.

Materials and Methods: Seventeen patients with solid malignancies were treated with sunitinib malate, a molecular targeted agent. Using the cellular proliferation marker [¹⁸F]FLT, whole-body PET/CT scans were acquired pre-, mid-, and post-treatment. Highest FLT uptake lesions (~2/patient) were segmented on PET images and tumor response was quantified via the relative change in SUV_{mean}, SUV_{max}, SUV_{total}, and SUV_{peak}. Since the SUV_{peak} ROI is not uniquely defined, additional tumor responses were determined by changing the SUV_{peak} ROI shape (circles vs. spheres), diameter, and location (centered on SUV_{max} vs. placed in highest uptake part of tumor). Response variation was measured using the standard deviation of the SUV response measures. All results are quoted as standard deviations.

Results: Tumor response was sensitive to the SUV measure used to quantify the response. On average, different SUV measures resulted in substantial variation (20%) in quantification of tumor response. For individual tumors, the most extreme variation in response measures was 55%. On average, differences in tumor response were largest between SUV_{mean} and SUV_{total} and smallest between SUV_{max} and SUV_{peak}. Different SUV_{peak} ROI definitions also resulted in variation in tumor response (10%), with a maximum variation of 30%. SUV_{peak} ROI location caused greater variation in tumor response than diameter or shape.

Conclusions: Different SUV measures resulted in substantial variation in quantification of treatment response. Variations were 20% on average but could be as high as 55%. These variations limit the conclusiveness of any single response measure since different SUV measures quantify different characteristics of the tumor. Therefore, PET-based treatment response criteria should incorporate multiple measures for more comprehensive response assessment.