

AbstractID: 11044 Title: Predictive power of various PET measures for treatment response assessment

Purpose: Assessment of treatment response in solid tumors is essential for disease management but typical response measures are limited and non-robust. We compared the predictive power of several PET-based measures in cancer patients receiving therapy.

Method and Materials: Fourteen adult patients with advanced 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. Lesions were segmented on PET images and treatment response was assessed via percent change of the following measures: SUV_{mean} , SUV_{max} , SUV_{peak} , SUV_{total} , and PET defined tumor size: unidimensional, bidimensional, and volume. PET response assessment and clinical endpoint of therapy were used independently to classify patients into response categories: partial response (PR), stable disease (SD), or progressive disease (PD). Predictive power and robustness of PET measures were tested by varying response category cutoffs to generate ROC curves and Matthews correlation coefficients (MCC), a classification quality measure.

Results: SUV measures demonstrated improved predictive power over PET defined size measures ($MCC_{average}$: 0.27 vs. 0.21). Of all measures, SUV_{peak} was the most robust response predictor ($MCC_{average}$: 0.30, MCC_{max} : 1.0), especially for prediction of PR. Of PET defined size measures, bidimensional size was the most robust response predictor. Changes in SUV measures pre- to mid-treatment showed improved predictive power over pre- and mid- to post-treatment changes ($MCC_{average}$: 0.32, 0.27, and 0.22 respectively). Prediction of PR was vastly superior to that of SD and PD ($MCC_{average}$: 0.44, 0.16, and 0.14 respectively). ROC analysis supported MCC results.

Conclusion: Comparison of PET-based measures revealed that SUV measures were more predictive of response than PET defined size measures. SUV_{peak} , a rarely used functional measure, demonstrated the most robust predictive power. Future treatment response studies should test and implement more robust measures, like SUV_{peak} , for improved response assessment.