AbstractID: 13334 Title: Effect of PET image reconstruction parameters on quantitative treatment response assessment

Purpose: Changes in SUV are typically used for PET-based treatment response assessment. However, the absolute value of SUV varies with different reconstruction methods. We studied the effect of different PET image reconstruction parameters on quantitative treatment response assessment.

Method and Materials: Six patients (~2 tumors/patient) were treated with molecular targeted therapy and received three whole body [^{18}F]FLT (cellular proliferation marker) PET/CT scans at different time points of therapy. Images were reconstructed using filtered backprojection and the OSEM algorithm with varying grid size, number of iterations, and post filter. Each tumor was contoured on a reference reconstruction. This contour was applied to all reconstruction, and SUV_{mean}, SUV_{max}, SUV_{peak}, and SUV_{total} were calculated. Treatment response was assessed by change in SUV between scans, normalized to the first scan. The effect of the reconstruction parameters on treatment response was evaluated via the percent difference from the reference reconstruction method which used the OSEM algorithm.

Results: FBP yielded higher percent differences than the OSEM reconstructions for all measures. For the OSEM reconstructions, the range was 15%, 50%, 85%, and 25% for the change in SUV_{mean}, SUV_{max}, SUV_{peak}, and SUV_{total} respectively, while FBP yielded ranges of 60%, 100%, 150%, and 60%. Change in SUV_{max} and SUV_{peak} had the greatest percent differences from the reference reconstruction. The percent difference was as high as 65% and 115% for the change in SUV_{max} and SUV_{peak} respectively when images were reconstructed with FBP compared to 25% and 65% when they were reconstructed with OSEM.

Conclusion: Image reconstruction parameters affect treatment response assessment, particularly when SUV_{max} or SUV_{peak} are used. Overall, the greatest variation was due to the image reconstruction algorithm. Consistency of reconstruction algorithm and parameters will not eliminate the inherent differences that exist with the use of SUV measures for treatment response assessment.