AbstractID: 9533 Title: Radiotherapy response assessment using deformed serial 18F-FDG PET/CT

Purpose: To assess the ability of SUV measured on serial ^{18}F-FDG PET/CT to differentiate radiotherapy (RT) responders from non-responders.

Method and Materials: Between November 2005 and August 2007, 88 eligible patients with AJCC stage III-IVb HNSCC were enrolled in an IRB approved protocol to receive serial PET/CT imaging studies prior to and following RT. Analysis of similar anatomic volumes on temporally separated images was facilitated with a deformable image registration technique to map pre- and post-RT CT images to a reference image set, namely the RT planning CT images. The resulting deformable transformations were applied to the pre- and post-RT PET images, thereby aligning both PET data sets to the RT planning CT images. SUV reduction factors were created from pre- and post-RT SUV ratios and calculated for RT contours and fixed thresholds of the maximum signal intensity on PET images. Variations in pre- and post-RT PET/CT scanner model and uptake duration were controlled to eliminate possible confounding factors for intrapatient analysis.

Results: Cross correlation of patients whose serial PET/CT images were collected with the same scanner model and with uptake duration differences $\leq$ 15 min reduced the useable number of patients drastically from 88 to 10. For the controlled patient cohort, the average SUV reduction factor for responders (N = 7) vs. non-responders (N = 3) calculated for the GTV contour was (1.4 $\pm$ 1.6) and (1.0 $\pm$ 1.7), respectively. For all contours (N = 4), nonparametric testing revealed [P > 0.05].

Conclusions: The average SUV reduction factor was not able to significantly differentiate responders and non-responders in all contours studied. The large reduction in useable patients following strict data set control may be an important cautionary note for future studies investigating serial PET/CT for treatment response monitoring.

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