

AbstractID: 14318 Title: Effects of ROI placement on quantitative intra-treatment tumour response assessment using FDG-PET

**Purpose:** Intra-treatment response assessment using standardized uptake values (SUVs) requires the use of region of interest (ROI) for quantification. A fixed-size ROI is commonly used, where the ROI is placed at the maximum uptake point in the pre-treatment (Pre-Tx) study. However, for intra-treatment (Intra-Tx), the ROI is placed at the maximum uptake point *or* at the same location as the Pre-Tx ROI. Therapy-induced geometric changes of tumour and normal structures may affect the latter ROI method. We have quantified these geometric changes and compared the two ROI methods.

**Methods:** The two ROI methods were compared in 15 radiotherapy patients. Fixed-size ROIs for all tumours were centered at the maximum SUV for both Pre-Tx and Intra-Tx (ROIpeak). Additional Intra-Tx tumour ROIs were placed at the same locations as Pre-Tx ROIs using anatomical landmarks (ROIsame). ROIsame was shifted in different directions to evaluate the effects of uncertainties in its placement on response assessment. To quantify the geometric changes, normal structures and tumour ROIs were contoured both in Pre-Tx and Intra-Tx in 10 independent radiotherapy patients. Geometric changes were calculated using percentage volume losses and center of mass shift.

**Results:** The response measure using ROIsame was on average 8.2% higher than ROIpeak, but the measures were highly correlated (Pearson  $r = 0.94$ ). The median volume loss was 76% and 30% for the primary tumours and salivary glands (parotid and submandibular) respectively. Other soft tissues and bones did not show significant volume losses. The median shift for all tumours was 5.9 mm.

**Conclusion:** Tumour shift during the therapy will affect quantitative response assessment if one chooses to place the Intra-Tx ROI at the same location as Pre-Tx ROI. The two ROI methods will influence quantitative response assessment, but should have similar accuracies. Due to its simplicity and observer-independence ROIpeak appears to be preferable over ROIsame.