AbstractID: 11162 Title: Predicting tumor local control in lung cancer from pre-treatment PET/CT image features

Purpose: The role of PET/CT imaging in radiotherapy treatment planning and monitoring has been increasing on a rapid pace. There is accumulating evidence that characteristics of pre-treatment FDG-PET could be utilized as prognostic factors to predict radiotherapy outcomes in different cancer sites. Direct standardized uptake value (SUV) measurements were traditionally used to assess risk. To improve our understanding of embedded information in PET/CT we are investigating an alternative image-feature based approach for analyzing and predicting post-radiotherapy local control in non-small cell lung cancer (NSCLC) patients.

Method and Materials: We analyzed pre-treatment PET/CT scans of thirty-one patients for the endpoint of local/loco-regional failure. The Gross Tumor Volume (GTV) was considered as the region of interest (ROI). All patients underwent pre-radiotherapy diagnostic PET/CT and the images were registered with their corresponding treatment planning CT. We studied the effect of motion artifacts using deblurring methods based on deconvolution with a 4D-CT derived motion kernel. Features from the GTV region based on intensity-volume histogram (IVH) metrics and texture characteristics were extracted from each CT image, PET image with and without motion correction.

Results: About thirty candidate features were extracted for each case and were analyzed for assessment of patients' risk of failure. Our preliminary results indicate that IVH metrics and texture features could be potentially useful for failure prediction in NSCLC compared to volume and maxSUV. PET seemed to be more informative than CT in general. Motion correction affected the feature values and not the general trend in this data.

Conclusion: We have explored new methods for analyzing failure risk in NSCLC from PET/CT data. Our results suggest a role for functional imaging based on image features in predicting risk of failure. However, further analysis of these variables and cross-validation is still needed to determine which parameters are strong predictors of radiation treatment response.