

AbstractID: 9381 Title: Average CT in colorectal cancer PET studies

Purpose: To assess the effect of average CT (ACT) used for attenuation correction of PET data on SUV_{max} and gross tumor volume (GTV) in liver lesions of colorectal cancer patients.

Method and Materials: We studied 34 colorectal cancer patients with metastasis in the liver. A routine PET/CT scan was immediately followed by a cine CT scan of the liver region for ACT. Patients were free-breathing during the helical CT (HCT) and ACT acquisitions. Both HCT and ACT were used for attenuation correction of the PET data. 59 liver lesions were included in the study and SUV_{max} for each lesion was measured on PET_{HCT} and PET_{ACT} . Both PET data sets were imported to Pinnacle³ 7.6 treatment planning system. GTVs for PET images were generated based on the SUV thresholds, normally used for assessing tumor response to therapy. Percentage volume change, centroid shift and concordance index were defined for each lesion.

Results: 67% of the studies showed respiratory artifacts in PET_{HCT} while 15% demonstrated a difference in SUV_{max} above 20%. The effect of misregistration between HCT and PET data was more evident for smaller lesions with the most pronounced case showing a 29% increase in SUV_{max} for PET_{ACT} , 246% increase in GTV, 2mm shift in GTV centroid location and concordance index value of 0.34. We analyzed correlation between the variations and the lesion size with a non-paired t-test at 0.05 p-value level. The means of concordance indexes in two distributions of the lesions normalized to their size (less and greater than 5cm³) were shown to be significantly different ($p=0.007$).

Conclusion: ACT is effective in improving the registration between the CT and PET data in PET/CT, which is important when using PET images for treatment planning. Misregistration is more pronounced for small lesions and should be considered in the generation of the GTVs.