AbstractID: 9212 Title: Effects of Background Activity on Partial Volume Correction in PET imaging

Objectives: PVC techniques based on a-priori knowledge of object size have been previously proposed and evaluated. The aim of this abstract is to investigate the effect of background activity (BA) correction on the accuracy of PVC.

Methods: An IEC phantom containing six spheres (1-3.7cm) was scanned using GE DRX PET/CT scanner. The sphere to background ratio (SBR) was (4:1, 6.5:1, 11.1:1) while keeping BA concentration constant. BA was set to that found in the thorax of clinical PET studies. PET data was acquired in 3D mode for 3 minutes. ROIs were drawn on all spheres. PVC was then applied with and without background subtraction (BS) while using the scanner's point spread function (PSF) and the sphere size obtained from CT. Care was taken to include the effects of reconstruction filter on the PSF. For PVC with BS, the BA was first subtracted from the mean sphere activity concentration (AC) and then divided by the convolution of the PSF with a binary map of the true sphere size obtained from CT. Finally, BA was then added to give the corrected sphere AC. Plots of mean AC with and without BS versus sphere size were generated and differences between the two corrections were calculated.

Results: PVC with BS was consistently better than without BS for different SBR and sphere sizes. This effect was more pronounced as SBR and sphere size decreased. PVC with BS was on average 6.7% different than the true value while that without BS was 28.5% different. The smallest sphere had the biggest discrepancy with a difference of 64.3% and 13.9% for PVC without and with BS respectively.

Conclusion: Background effects can impact the accuracy of PVC in PET images, especially for small SBR and tumor size. BS should be implemented with PVC to insure accurate lesion quantification.