AbstractID: 11019 Title: Partial volume correction in PET images: a single correction method applied for multiple source to background ratios

Purpose: With the growing importance of PET for determining prognosis and assessing response to therapy, methods are needed to generate quantitative statistics that accurately reflect true activity levels. Difficulties can arise in implementing partial volume correction (PVC) methods due to inaccurate tumor volumes and the wide range of tumor to background ratios that occur clinically. We have created a PVC method based on homogeneous activity in spheres, using our gradient-based PET segmentation technique for size approximation, which will equal or underestimate SUV in the clinical situation. **Methods & Materials:** PET scans were acquired for spherical phantoms with fillable spheres emulating clinical conditions of activity levels, acquisition and reconstruction. Phantom studies were acquired with C-11 background and F-18 in the spheres to obtain contrast levels ranging from 5:1 to 70:1. The spheres, radii 5mm, 6.5mm, 8.5mm, 11mm, 14mm and 18.5mm, were segmented using the gradient algorithm. A single exponential curve was fit to the maximum activities to produce a correction factor based on gradient-based segmentation radius with the maximum value in the largest phantom serving as ground truth. **Results:** The uncorrected SUV percent error was very consistent for different contrast levels ranging from -32.0% (28.3%), Mean (SD), for 5:1 to -33.1% (29.0%) for 70:1. The uncorrected errors for the 5, 6.5, 8.5, 11, and 14mm phantoms were -70.8 (2.6%), -54.3 (4.5%), -31.5% (3.7%), -10.0% (6.0%), -2.1% (2.3%), respectively. After correction, they were reduced to -13.6% (17.7%), 8.0% (10.8%), 1.0% (10.0%), -2.0% (7.3%), -1.5% (2.5%), which was statistically significant for each phantom size at $p<0.01$ using a paired t-test. **Conclusions:** The PVC method provides a means for more closely reflecting the true activity levels of tumors resulting in more accurate quantitative assessments. Monte Carlo simulations will help to determine accuracy for different tumor shapes and activity distributions. Research sponsored by MIMvista Corp.