

Purpose: Partial voluming in PET imaging leads to underestimation in activity concentration. The aim of this abstract is to correct for partial volume artifacts in PET/CT scans.

Method and Materials: A Jaszczak phantom with hollow spheres of varying sizes (4.95 – 31.27 mm inner diameter (ID)) was filled with F-18 water using 3 different sphere-to-background ratios (SBR), ranging from 3:1 to 10:1. For each SBR, several acquisitions were conducted. All PET data was reconstructed using OSEM (2 iterations, 21 subsets). Regions were drawn on the CT images to obtain accurate sphere volume and location. A software tool was written to correct for partial voluming by incorporating the sphere size and the non-stationary response function of the scanner. The original maximum (OM), original average (OA), corrected maximum (CM), and corrected average (CA) activity concentrations (AC) were measured and compared.

Results: For all SBRs, spheres larger than 19 mm the measured OM and OA AC were 111 and 77% of the true value, respectively. Following correction, these values changed to 128 (CM) and 102% (CA), respectively. For the smallest sphere size (4.95 mm), the measured OM and OA AC were both 20% of the true value. Following correction, these values changed to 121 (CM) and 104% (CA) of the true value. The CM, however, did vary between 83 and 176% of the true AC. An analytical relationship between the lesion size (obtained from CT) and the amount of correction needed to recover the true AC based on the multiple acquisitions was generated.

Conclusions: To determine the true AC of a lesion from a PET/CT scan, the corrected average is more accurate than the original maximum, and should be used for clinical assessment.