

## **Impact of Point-spread Function Reconstruction on Quantitative FDG-PET/CT Imaging Parameters and Inter Reader Reproducibility in Solid Tumors**

Tuesday 3:10-3:20 PM | SSJ17-02 | S505AB

Trainee Research Prize - Fellow Award: Trainee Research Prize - Fellow

**Sara Sheikhabahaei, MD, MPH Baltimore, MD (Presenter)**

**Charles Marcus, MD Baltimore, MD**

**Rick Wray, MD Baltimore, MD**

**Arman Rahmim, PhD Baltimore, MD**

**Martin A. Lodge, PhD Baltimore, MD**

**Rathan M. Subramaniam, MD, PhD Baltimore, MD**

### **PURPOSE**

Recent studies suggest that implementation of the point spread function (PSF) in the reconstruction algorithm of positron emission tomography (PET) improves the spatial resolution of PET images. However, there is little known about the influence of PSF reconstruction on volumetric measurements in PET/CT. This study aims to determine the impact of PSF reconstruction on quantitative PET/CT indices and the inter-reader reproducibility of these measurements.

### **METHOD AND MATERIALS**

Study was approved by the Institutional Review Board under a waiver of informed consent. A total of 42 oncology patients with 89 lesions (all  $\geq 2$ cm) were included. The PET/CT images were reconstructed with PSF (OSEM+TOF, 2i, 21s, all pass filter) and without PSF (OSEM+TOF, 2i, 21s, 5 mm Gaussian). For each lesion, the maximum, mean and peak standardized uptake values (SUV), total lesion glycolysis (TLG), and metabolic tumor volume (MTV) were measured by two readers (R1, R2) using a semi-automatic gradient segmentation method. Intra-class correlation coefficient (ICC) and Bland-Altman analyses were performed.

### **RESULTS**

There was excellent correlation between non-PSF and PSF reconstruction PET/CT values [ICC $\geq$ 0.950 for all parameters, P<0.0001]. Bland-Altman analyses comparing PSF with non-PSF images showed the average biases (%) of +11.14 (R1) and +11.1 (R2) for SUV<sub>max</sub>, +7.04 (R1) and +7.54 (R2) for SUV<sub>mean</sub>, +7.03 (R1) and +7.06 (R2) for SUV<sub>peak</sub>, -2.62 (R1) and -3.17 (R2) for TLG, and -9.61 (R1) and -10.43 (R2) for MTV. Percentage changes in PSF versus non-PSF indices were not related to the site of the lesions (P>0.05). Close agreement was observed between two readers [ICC ranged between 0.908-0.997, P<0.0001].

### **CONCLUSION**

The PSF reconstruction increases the SUV<sub>max</sub>, SUV<sub>mean</sub> and SUV<sub>peak</sub>, as expected, while it tends to produce lower values for MTV and has variable effect on TLG. This can be attributed to the ability of PSF reconstruction to better discern tumor uptake from activity spill-out.

### **CLINICAL RELEVANCE/APPLICATION**

Reconstruction method of PET/CT should be carefully considered in reporting quantitative parameters, subsequent lesion classifications and comparisons for therapy assessment.