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### **Evaluation of Positron Emission Mammogram (PEM) and PET/CT Imaging in Breast Cancer**

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#### *Abstract:*

**Objective:** FDG-PET sensitivity for detecting primary breast cancer has been shown to decrease with decreasing tumor size. Positron emission mammography (PEM) has improved spatial resolution (FWHM: 1.5 mm) over conventional whole body PET and PET/CT scanners (FWHM: 4 to 6 mm) and would be expected to offer more accurate delineation of tumor margins than PET. The purpose of this study is to compare the tumor volumes and measurement methods using PEM and PET/CT.

**Methods:** Ten female patients (52.2 years  $\pm$  5.9) underwent PET/CT and PEM imaging for breast cancer evaluation. PEM images of patients' both breasts were acquired in the medial lateral oblique and cranio-caudal views with mild compression. Tumor-to-normal tissue contrast, standard uptake value (SUV), and metabolic tumor volumes (MTVs) were measured. MTVs were estimated using the gradient-based edge detection, 40% threshold, and SUV (voxels with SUV  $\geq$  2.5 for PET) methods.

**Results:** Both PEM and PET images produced distinctive tumor-to-normal tissue contrast values of 0.76 and 0.81, respectively. The mean SUVs for PET MTVs were 4.6, 5.4, and 5.2 by the edge detection, threshold, and SUV methods, respectively; while the mean SUVs for PEM were 1.6 and 2.7 by the edge detection and threshold methods, respectively. Measured PEM MTVs were 1.5 times greater than PET MTVs by the edge detection and threshold methods. The threshold method yielded smaller volumes than the edge detection method for both of PEM and PET.

**Conclusions:** PEM images demonstrated distinctive tumor-to-normal contrast values similar to PET. PEM SUV scales were different and smaller than PET, probably relating to the limited angle reconstruction with PEM. In general, PEM MTVs were greater than PET MTVs either using the edge detection or threshold method. PEM has important potentials as a complimentary means for the screening and staging, and surgical or radiation treatment planning in breast cancer.

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**Topic (Complete):** Novel Imaging for Clinical Studies

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