

AbstractID: 12882 Title: Evaluation of quantitative error of a commercially-available positron emission mammography scanner

Purpose: To evaluate the overall quantitative accuracy of, the PEM Flex Solo II (Naviscan Inc., San Diego, CA) positron emission mammography scanner, and to assess the relative contributions of error from attenuation, scattered photons and count-rate.

Method and Materials: The overall error was measured in 4, 6, 8, 10 and 12-cm thick breast phantoms with uniform background activity (0.07 $\mu\text{Ci/cc}$), simulated lesions (2:1, 5:1 and 10:1 lesion-to-background ratios) and cysts. The effect of count-rate was determined by comparing the overall error to the error at lower background activity concentration (0.007 $\mu\text{Ci/cc}$) for each thickness. The error due to attenuation was measured for each thickness by comparing the maximum pixel values in a point source embedded in non-radioactive gelatin to the maximum pixel value of the same point source scanned in air. The error due to scatter was determined by comparing the sum of all pixel values in the image volume of the point source in each thickness of gelatin to the sum of all pixel values from the point source in air.

Results: The overall background error in 4 to 12-cm thick phantoms was $0\%\pm 7\%$ to $-32\%\pm 7\%$, respectively. The minimum error in lesions was $-24\%\pm 4\%$ for 2:1 lesion-to-background ratio in 4-cm thick phantoms, and increased with phantom thickness and lesion-to-background ratio. The error contributed by count-rate was approximately $-24\%\pm 9\%$ for 4 to 8-cm thicknesses, $-30\%\pm 6\%$ for 10-cm and $-8\%\pm 8\%$ for 12-cm. Attenuation contributed $-51\%\pm 10\%$ to $-77\%\pm 5\%$ for 4 to 12-cm thicknesses, respectively. Scatter contributed $23\%\pm 2\%$ for all thicknesses.

Conclusion: Images from the PEM Flex Solo II cannot be used for accurate quantitation due in part to the lack of corrections for count-rate, attenuation and scatter. Even with these corrections, limited angle tomography will be an obstacle to achieving accurate quantitation.

Conflict of Interest (only if applicable): NA