AbstractID: 10953 Title: Lesion Detectability of a PEM System with a Proposed Breast Image Quality Phantom

Purpose:

The aim of this study is to evaluate the lesion detectability of a PEM scanner using a proposed PEM specific breast image phantom with lesions of various sizes and activities.

Method and Materials:

A customized image quality phantom was designed with hot rod inserts and a warm background that simulated a breast with lesions. The phantom was about the size of a breast (130 mm x 130 mm x 66 mm). The inserted hot rods had diameters approximately 10 mm, 5 mm, 4 mm, 3 mm and 2 mm. Activities were 3.5, 6.8 and 12.7 times the background activity. The background activity was 0.05 μCi/cc. The scan protocol was 20 minutes full field of view. The 3D image array (200 x 136 x 24 voxels) was generated for analysis. We analyzed the recovery coefficients of the rods as a function of the activity and rod size. From a fit to the data, we extrapolated the minimum detectable lesion size for each activity level.

Results:

The results showed that the PEM scanner can detect 1.2 mm hot rod that had 12.7 times background activity and 1.5 mm hot rod that had 6.8 times the background activity. It could also detect the hot rod with 3.5 times background activity down to the 3.3 mm rod.

Conclusion:

This study investigated the performance of a PEM scanner in detecting small lesions with various activities. The result quantified the potential limit of the lesion size that can be distinguished from the background in clinical practice. The proposed phantom showed its design was well suited for this kind of study.

Conflict of Interest:

Research sponsored by Naviscan, Inc.