Preliminary Evaluation of ETACT Scintimammography

We have performed a preliminary evaluation of emission tuned aperture computed tomography (ETACT), a novel approach to scintimammography. In ETACT, a series of tomographic slices of the tracer distribution in the breast can be reconstructed from a small number (5-10) of projection images with the use of fiducial markers. The projection data are acquired with a pinhole collimator to take advantage of its high spatial resolution. Projection data are reconstructed tomosynthetically and an iterative axial deconvolution is applied. Computer simulations were performed to investigate the effect of pinhole size on signal-to-noise ratio (SNR). ETACT projections of a computer model of a breast with a 1 cm tumor (5:1 T/NT ratio) were simulated for a 3, 4 and 5 mm pinhole aperture. The use of a 4mm pinhole yielded the optimum contrast and SNR for this particular imaging task (C = .133, .177, .122 and SNR= 1.92, 2.20 and 2.01 for 3, 4, 5 mm, respectively). ETACT was then performed on the Data Spectrum breast phantom with a 1 cm tumor (10:1 T/NT). Eight projections were acquired with a 4 mm pinhole for 5 min each about the left lateral of the phantom. The ETACT reconstructed data yielded a significant improvement in contrast (0.52 vs 0.20) and SNR (1.85 vs 0.54) relative to planar imaging. These preliminary results indicate that ETACT is a promising new approach to scintimammography.