AbstractID: 7247 Title: Digital breast tomosynthesis mammography: Computerized classification of malignant and benign masses

Purpose: To develop a computer-aided diagnosis system to assist radiologists in classification of malignant and benign masses on digital breast tomosynthesis (DBT) mammograms.

Method and Materials:
We used a data set of 60 cases (30 malignant and 30 benign) acquired with a GE Gen1 prototype DBT system located at the Massachusetts General Hospital. The DBT system acquired 11 projections in 5-degree increments over a total arc of 50 degrees. The DBTs were reconstructed at a slice spacing of 1 mm using a simultaneous algebraic reconstruction technique. In this preliminary study, the volume of interest (VOI) containing the mass and its central slice were manually identified. The mass on each slice was segmented by an active contour model initialized with adaptive k-means clustering. A band of pixels around the segmented mass boundary underwent the rubber band straightening transform (RBST) and the RBST image was enhanced by Sobel filtering. Morphological, spiculation, and texture features were extracted from the segmented mass and the enhanced RBST image. Two approaches for analysis of the masses were compared, one used the features from the central slice alone and the other used the average of the corresponding features over five slices centered at the central slice. Using leave-one-case-out resampling, a linear discriminant analysis (LDA) classifier with stepwise feature selection was trained and tested in each feature space to classify the masses.

Results:
The LDA classifier achieved an area under the test receiver operating characteristic (ROC) curve of 0.93 ± 0.03 using the 5-slice approach, compared to 0.82 ± 0.05 using the single-slice approach. The difference was statistically significant with $p<0.001$.

Conclusion:
The preliminary results demonstrate the feasibility of computerized classification of masses in DBT. Further studies are underway to compare various approaches for using DBT volumetric information to characterize masses.

Conflict of Interest:
MGH group received support from GE Medical Systems