

AbstractID: 10990 Title: Performance of a method to aid breast ultrasound interpretation using image processing and case-based reasoning

Purpose: To examine factors that may impact accuracy, reproducibility of Breast Ultrasound CADx software. Goal for CADx is standardized reporting of findings using well-defined descriptors and to aid accuracy and reproducibility of interpretation by radiologists. **Method and Materials:** Breast Companion® (BC, Almen Laboratories and UCSD) provides tools to analyze breast masses. It computes 9 features of the mass, compares these to images in Reference Library of masses with known findings. Using Relative Similarity it retrieves instantaneously a cluster of the most similar cases and outputs numerical data including Computerized Lesion Assessment (CLA) following the ACR BI-RADS assessment category (1 through 5). **Results:** On 596 cases with known findings BC achieved ROC Area 0.98 ± 0.02 , Sensitivity 99.7%, Specificity 96.1%, significantly higher than four experienced radiologists who read the same cases (ROC Areas 0.88 to 0.90 ± 0.02). Increasing the number of cases in the Reference Library from 41-331 and the number Test Set cases from 20-924 keeping mix same, ROC varied from 0.90 ± 0.07 to 0.98 ± 0.02 (NS). In 55 cases (40% malignant) with confirmed findings BC calculated CLAs for radial and anti-radial images that were highly correlated, not significantly different by two-tailed t-test ($p > .5$). CLA for simple cysts was 2.0, mean for complicated cysts was 2.5, 3.0 for solid benign and 4.5 for malignants. 28 subjects (40% malignant) were analyzed who had exams of the mass on two different occasions within 3 weeks on GE and Siemens (NS difference). Simulated masses of were imaged over 3 months at 9, 10, 13 MHz with varying gain, dynamic range, focal depth post-processing. CLA was stable and independent of or linearly scaled to machine parameters.

Conclusion: The BC system accuracy is high, stable over range of conditions. Measured parameters are dimensionless, relative to their backgrounds so it appears normalization achieves mitigation in machine effects.