AbstractID: 11398 Title: Analysis of Tumor Grade Breast Carcinoma using Computer-Extracted Morphological and Kinetic Features in DCE-MRI

Analysis of Tumor Grade of Breast Carcinoma using Computer-Extracted Morphological and Kinetic Features in DCE-MRI

Purpose: An important prognostic marker in breast cancer is the histological grade of the breast tumor. Thus, the purpose of our study is to investigate the performance of computer-extracted morphological and kinetic features in DCE-MRI in distinguishing breast tumors with varying histological grades: Grade 1, Grade 2, and Grade 3.

Materials and Methods: Breast MR images were obtained with a T1-weighted SPGR sequence using Gd-DTPA on a 1.5T GE MRI scanner. Each case has one precontrast and three to five postcontrast series at intervals of 68 seconds, and each series contains 60 coronal slices. The database contains 135 invasive ductal carcinoma (IDC) breast lesions including 21 Grade 1 lesions, 72 Grade 2 lesions, 42 Grade 3 lesions, and 133 benign lesions (no cysts). All lesions were verified pathologically. Each lesion was segmented and its characteristic kinetic curve was extracted using the fuzzy c-means method. Textural, morphological, kinetic, and spatial enhancement variance features were extracted, and stepwise linear discriminant analysis using a Wilks lambda cost function in a round-robin fashion was used for feature selection. The selected features were merged using Bayesian neural network, and the classification performance was evaluated using receiver-operating characteristics (ROC) analysis.

Results: We achieved AUC values of 0.80±0.05, 0.85±0.02, 0.75±0.06, 0.74±0.05, 0.75±0.06, and 0.60±0.05 for the classification tasks of Grade 1 vs. benign, malignant (Grades 1-3 lesions) vs. benign, Grade 1 vs. Grade 3 lesions, Grade 1 vs. Grades 2 and 3 lesions, Grade 1 vs. Grade 2, and Grade 2 vs. Grade 3, respectively.

Conclusions: Computerized analyses of breast MR images have the potential to yield image-based prognostic markers for breast carcinoma, specifically in distinguishing different histological grades of breast tumors.