Associations between mammographic phenotypes and histopathologic features in ductal carcinoma in situ

Ruvini Navaratna¹², Aimilia Gastounioti¹, Meng-Kang Hsieh¹, Lauren Pantalone¹, Marie Shelanski¹, Emily F. Conant¹, Despina Kontos¹. ¹Department of Radiology, Perelman School of Medicine, University of Pennsylvania, ² Carnegie Melon University, Pittsburgh, PA

With the advent of regular breast screening, ductal carcinoma in situ (DCIS) diagnoses have risen in number, now making up almost 20% of all detected breast cancers at screening. However, recent studies suggest that up to 70% of DCIS lesions will never become life-threatening. The current paradigm of treating all DCIS cases aggressively, therefore, needs to change such that we can identify and treat only those women at risk of future life-threatening disease. Considering that histopathologic features have been shown to be predictive of DCIS aggressiveness, our aim was to study associations between mammographic phenotypes and histopathologic features towards identifying readily-available mammography-based prognostic biomarkers. To this end, breast density and parenchymal texture features were extracted from the ipsilateral breast in raw screening digital mammograms. Principal component analysis was used to construct an orthogonal basis of the original texture feature set to capture the dominant textural components. Primary analyses included statistical tests to compare feature distributions between histopathologic subgroups. Logistic regression analyses were then applied to evaluate trends in DCIS histopathologic characteristics among mammographic features, after adjustment for risk factors known to affect mammographic phenotypes. We found that HER2 had a significant association with breast percent density (p = 0.006) and the first principal component (PC1) of texture features (p = 0.034). After adjusting for established risk factors, our logistic regression analyses showed that breast percent density was predictive of HER2 status (AUC = 0.71), while prediction performance was further increased when PC1 was added to the model (AUC = 0.74). These findings provide preliminary evidence about the potential value of mammographic phenotypes in prediction of DCIS aggressiveness and could ultimately contribute to identifying patients who do not require treatment.