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Preliminary assessment of ShearWave™ elastography features in predicting breast lesion malignancy

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Introduction ShearWave™ elastography (SWE) provides a quantitative measurement of tissue stiffness with high spatial resolution and may improve characterization of breast masses. The goal of this study was to evaluate the reproducibility of SWE and the impact of adding SWE features to the BI-RADS classification of breast masses from the first 1,000 cases in a prospective multicenter trial.
Methods SWE studies were performed on a prototype of the Aixplorer system (Supersonic Imagine, Aix-en-Provence, France). A subset of 192 breast lesions (42.71% malignant) was analyzed. Reproducibility of SWE images and measurements was assessed; logistic regression analysis was performed to predict the pathology findings. SWE features were added to the ultrasound BI-RADS to generate models that were challenged by comparing the areas under the ROC curves (Az), and the sensitivity and specificity scores.
Results In the preliminary analysis, intra-operator reproducibility of SWE size ($R \geq 0.93$) and mean elasticity ($R = 0.88$) measurements were in near-perfect agreement. Using the best three-variable model (BIRADS + elasticity shape + maximum elasticity), the Az increased from 0.77 to 0.93 and specificity increased from 61.8% to 87.3%, although sensitivity decreased from 92.7% to 87.8%. Adding more variables did not effect further improvements.
Conclusions In this ongoing study, SWE provided reproducible information (elasticity values and SWE mapping) that improved the characterization of breast lesions. These features are directly linked to the characteristics of SWE: local quantification and millimeter resolution. Further evaluation of the study is in progress.

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To recognise the imaging of complications from Macrolane™ injection

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Introduction Macrolane™ volume restoration factor (VRF) (Q-Med) is in vogue for use in breast augmentation. There is sparse literature on the imaging characteristics of complications resulting from Macrolane™ injection.
Methods This study describes the multimodality imaging of 12 patients from three centres who had breast complications as a result of Macrolane™ injection. The patients had all undergone Macrolane™ injection at varying intervals prior to presentation. Macrolane™ consists of non-animal stabilised hyaluronic acid (NASHA™) and is approved for nonsurgical breast augmentation. Treatment involves injection of up to 100 ml fluid, superficial to the pectoral muscle and deep to the glandular breast disc, and is semi-permanent, usually only lasting up to 1 year before a top-up injection is required.
Results Presenting symptoms included breast lumps, breast pain and axillary pain. The complications seen on imaging included abscess formation, indeterminate masses, subpectoral collections and complex cystic collections. The fluid and indeterminate masses were not all resorbed in the timeframe expected of Macrolane™ and remained *in situ* in some cases for at least 2 years.
Conclusions Macrolane™ injection is associated with long-term complications and creates diagnostic challenges on breast imaging that are only beginning to emerge in the breast clinics and that may warrant triple assessment.

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Texture analysis applied to full-field digital mammography: ability to discriminate between invasive ductal and invasive lobular breast cancer – preliminary results

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Purpose To determine texture features of IDC and invasive lobular carcinoma (ILC) of the breast on full-field digital mammography (FFDM). To evaluate the ability of texture analysis to differentiate between those tumor types.
Materials and methods Fourteen IDC and nine ILC imaged with FFDM were included in this study. For each lesion the ROI was manually defined covering the lesion and 1 cm normal-appearing breast tissue around the lesion. Texture features derived from the grey-level histogram, the co-occurrence matrix, the run-length matrix, the absolute gradient, the autoregressive model, and the wavelet transform were calculated for the ROIs. Fisher coefficients were calculated to determine which texture features were best-suited for distinguishing between IDC and ILC. Based on the combination of those five texture features with the highest Fisher coefficients, lesion classification was performed, using linear discriminant analysis (LDA) and principal component analysis (PCA) classifiers, as well as a *k*-means clustering algorithm. Classification accuracy was used as the primary outcome measure.
Results Of the five texture features with the highest Fisher coefficients, the top four were derived from the wavelet transform. Using LDA and PCA, classification accuracies of 82.6% (19 of 23 lesions) and 78.3% (18 of 23 lesions) were achieved, respectively. *k*-means clustering also yielded a similar classification accuracy of 82.6% (19 of 23 lesions).
Conclusions Texture features, best suited for discrimination between ILC and IDC, are derived from the wavelet transform. Texture analysis of breast cancer cases imaged with FFDM allows a good degree of accuracy of discrimination between IDC and ILC.

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Sensitivity of integral computer-aided detection with full-field digital mammography for detection of breast cancer according to different histopathological tumor types and appearances

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Purpose To retrospectively evaluate the sensitivity of computer-aided detection (CAD) for full-field digital mammography (FFDM) in 360 breast cancers with regard to mammographic appearance and histopathological tumor type.
Materials and methods Three hundred and sixty breast cancers imaged with FFDM were evaluated retrospectively using CAD. A CAD mark was scored true positive (TP) if it correctly indicated a malignant lesion. All other CAD marks were considered false. Cancer cases were classified as microcalcifications (64), masses (196), or both (100). Histopathological findings were classified as IDC, ILC, DCIS or other. Sensitivity values for CAD according to mammographic appearance and, histopathological findings were analyzed using chi-squared tests.
Results A TP mark was observed on 319 out of the 360 cancers (89%). Calcifications were significantly ($P < 0.001$) more likely to be marked than masses, 163/164 (99%) compared with 244/296 (82%). The probability of a mass TP mark was significantly related to histological type ($P < 0.001$), with sensitivity being greatest for IDC at 76% (167/221) compared with 67% (38/57) for ILC, 31% (16/51) for DCIS and 74% (23/31) for other types. The probability of a calcification TP mark was also significantly related to histological type, with sensitivity being greatest for DCIS at 75% (38/51), compared with 43% (96/221) for IDC, 33% (19/57) for ILC and 32% (10/31) for other types.
Conclusions CAD prompted the significant majority of radiological abnormalities related to cancers and was most accurate for detection of calcification and DCIS, less so for mass lesions and ILC.