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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.