AbstractID: 13773 Title: Breast mass differentiation using Axial Shear Strain Imaging

Purpose: Since cancers infiltrate surrounding normal tissue, evoke a desmoplastic, scirrhous reaction and become firmly attached to background tissue, they tend to be less mobile than benign masses like fibroadenomas. We test the feasibility of using *in-vivo* axial-shear strain features to determine if the bonding of masses to background tissue can differentiate benign from malignant.

***Method and Materials*:** Radiofrequency data was acquired using a VFX 13-5 linear array transducer using a Siemens SONOLINE Antares real-time clinical scanner. Data were acquired for 41 biopsy-proven breast masses (8 malignant tumors and 33 benign fibroadenomas). Free-hand palpation using the transducer and deformations of up to 10% was utilized for data acquisition. A two-dimensional cross-correlation algorithm was used to generate axial strain and axial-shear strain images. Axial-shear strain values normalized to the breast mass dimensions, applied strain and strain contrast were utilized to calculate the feature called the "normalized axial-shear strain area**",** for differentiating benign from malignant masses.

Results: The normalized axial-shear strain area is significantly larger for malignant masses when compared to benign fibroadenomas. Scatter plots of the normalized axial-shear strain area demonstrates the feasibility for differentiating benign from malignant masses. Receiver operator characteristic analysis demonstrates the improvement in the classification obtained using the normalized axial-shear strain area. The area under the ROC curve of 0.996 suggests that this feature can effectively differentiate malignant tumors from the benign masses.

Conclusions: Axial-shear strain images may provide important additional information which along with currently utilized axial strain and B-mode images may improve differentiation of benign and malignant breast masses.

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