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Breast Tissue Characterization with Sound Speed and Tissue Stiffness Imaging

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In this study, we are going to assess the ability of SoftVue's waveform sound speed and through-transmission based stiffness image to render a variety of breast tissue and breast masses.

(2) Material and Methods

Transmission ultrasound provides additional characterization by measuring tissues parameters such as sound speed, attenuation, and through-transmission based tissue stiffness information. These parameters were used to assist characterization of breast tissue and breast masses. In this study, we focused on using SoftVue's sound speed image and tissue stiffness image rendered by combining sound speed and attenuation across individual coronal slices to help detection and characterization of breast tissue and breast masses.

(3) Results

The above metrics were applied to in vivo breast images reconstructed with the SoftVue system. A few examples are presented. First in vivo case has a well circumscribed cyst with an average sound speed of 1523 m/s. The stiffness image indicates that it is soft. Second in vivo case has a well circumscribed oval shaped fibroadenoma, which has moderate stiffness and an average sound speed of 1552 m/s. Third case is a highly spiculated IDC with an average sound speed of 1550 m/s and is stiffer than the surrounding dense breast tissue. In all three cases, fatty breast tissue has the lowest sound speed among normal breast tissue and breast masses, while breast parenchyma generally has higher sound speed than cyst.

(4) Discussion and Conclusion

We have established detection/diagnosis metrics for waveform breast sound speed and through-transmission rendered tissue stiffness information. A few examples demonstrate that a combination of sound speed and tissue stiffness information has great potential to assist detection and characterization of different breast tissues and breast masses.

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