Clinical Feasibility Study of Combined Opto-Acoustic and Ultrasonic Imaging Modality Providing Coregistered Functional and Anatomical Maps of Breast Tumors

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Principles of Opto-Acoustic Imaging

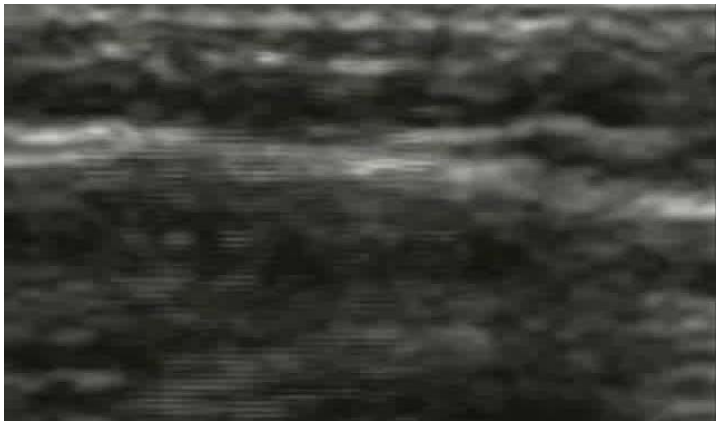
- Optical imaging provides high contrast BUT low resolution, and does not permit deep imaging.

- Ultrasound provides high resolution and tissue morphology, BUT low contrast for blood and provides neither quantitative molecular or functional images.

- **Solution**: Opto-acoustic (OA) imaging provides high contrast with molecular specificity, quantitative information and high resolution in the depth of tissue.

Real-time Optoacoustic vs Ultrasound Imaging of Blood Vessels

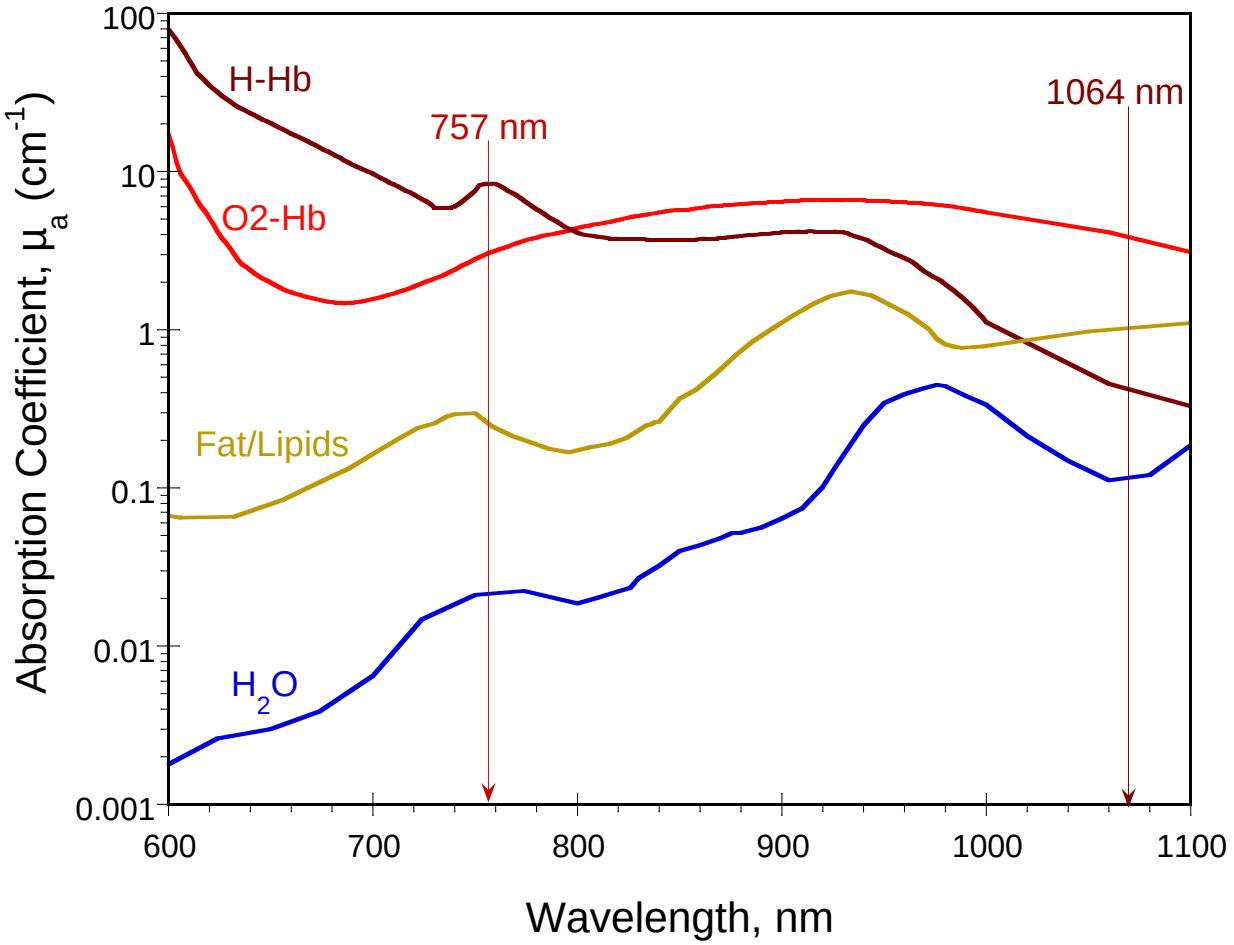
Ulnar Artery and a vein in Human Arm



Opto-acoustic image provides high contrast of blood

Ultrasonic Image provides high contrast of tissue morphology

Optical Absorption of Tissue as a Function of Laser Wavelength



The Imagio™ System
— The Combination of OA and US —

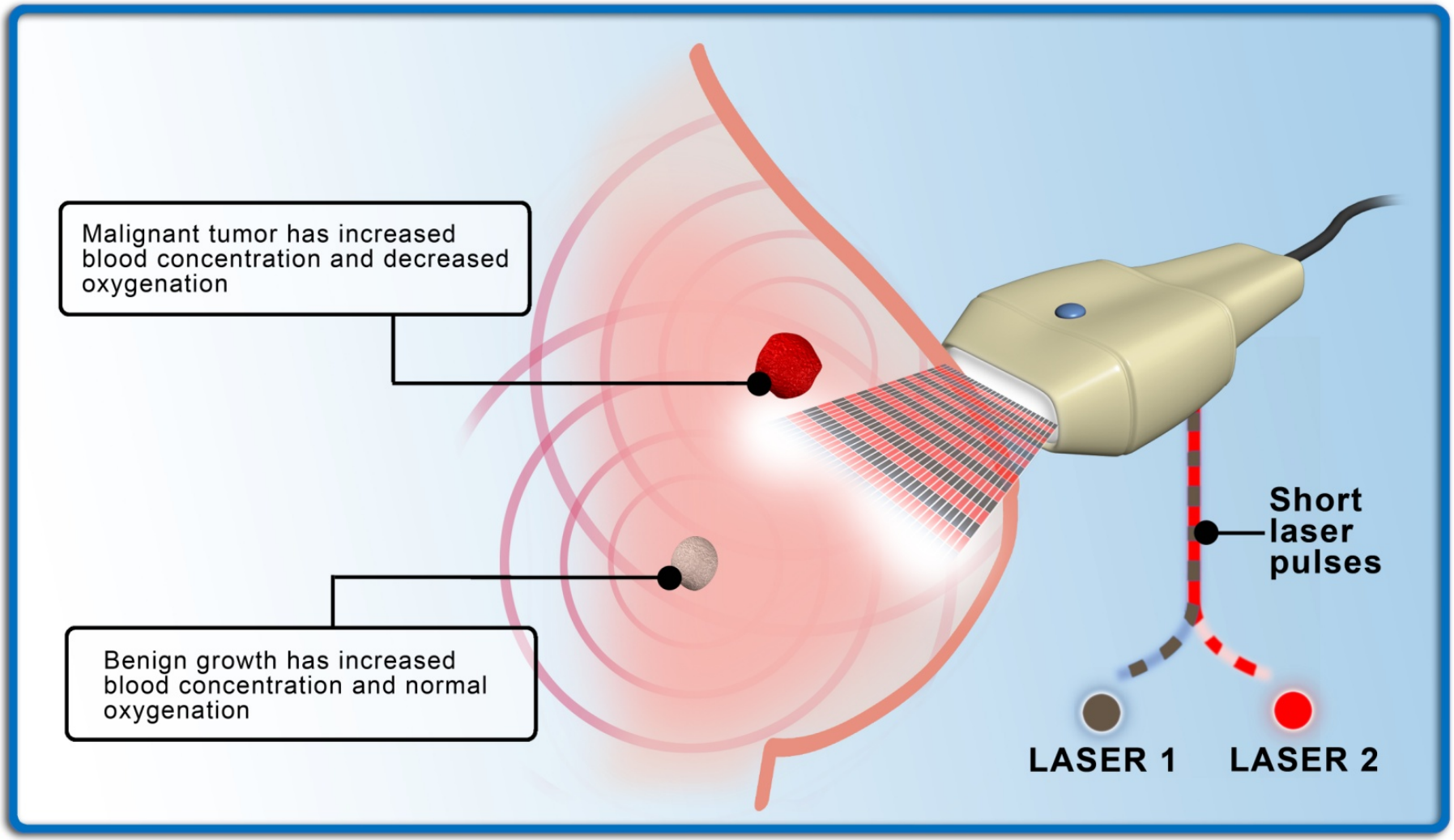
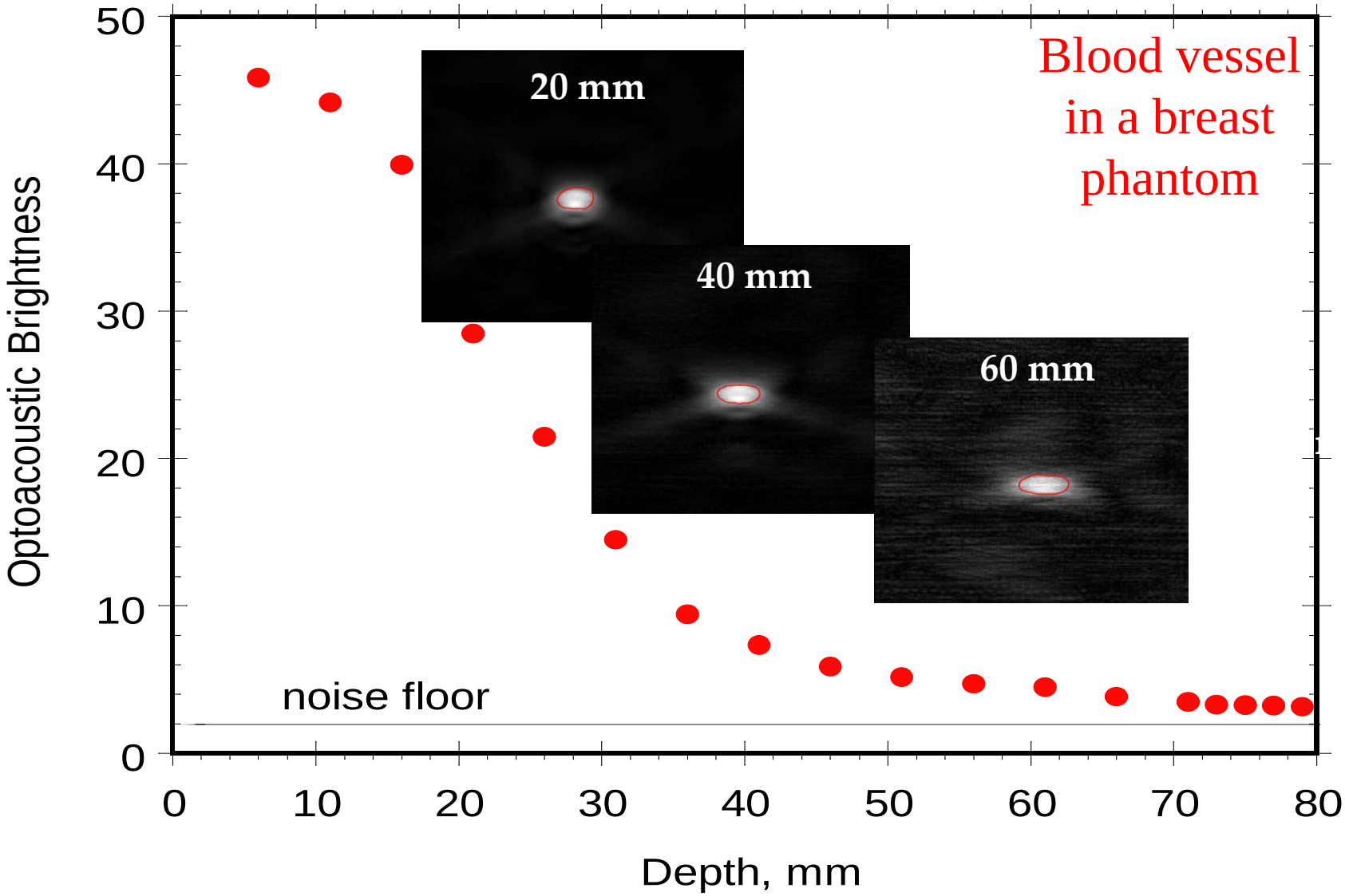


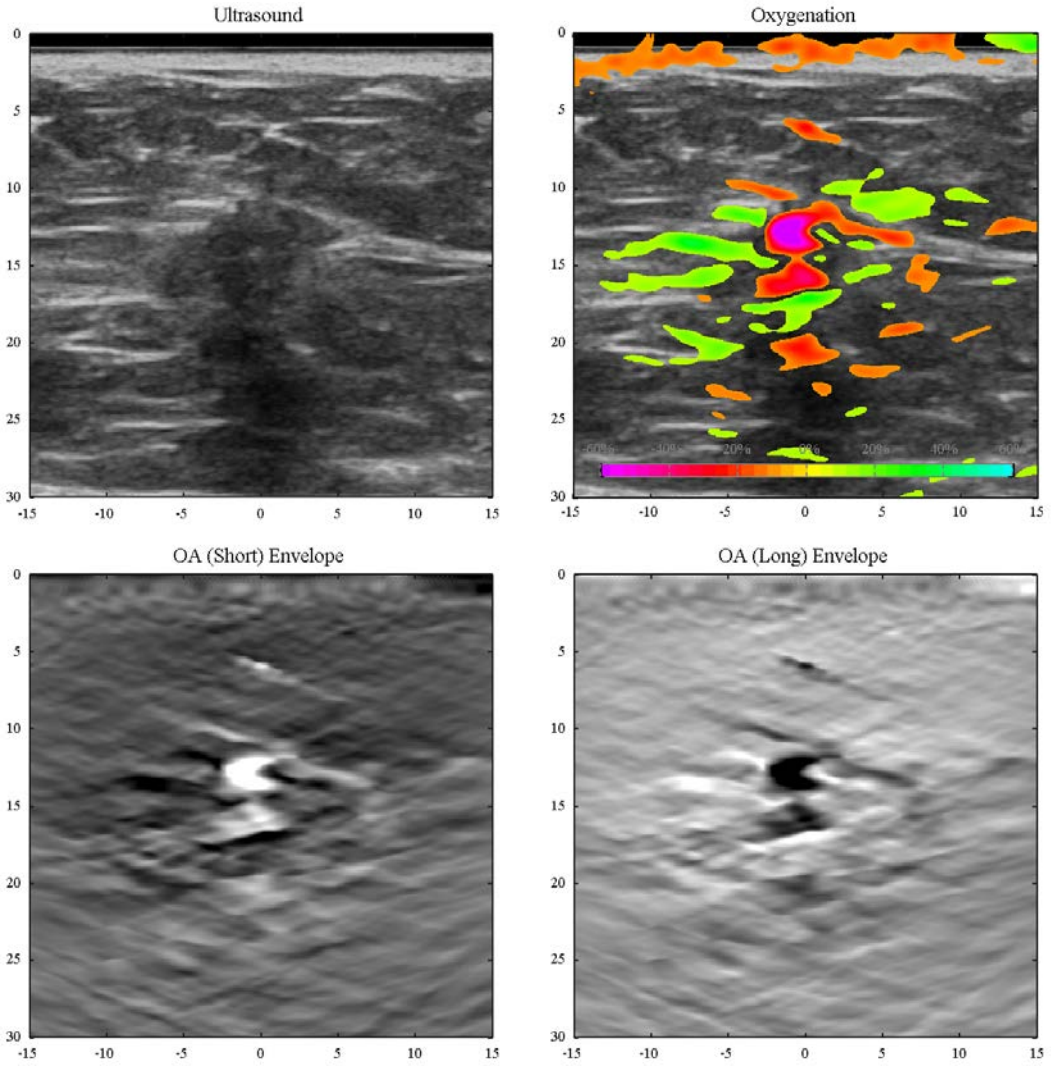
Image Contrast and Resolution *versus* Depth



Coregistered Ultrasonic and Optoacoustic Images

Ultrasound

Opto-Acoustic

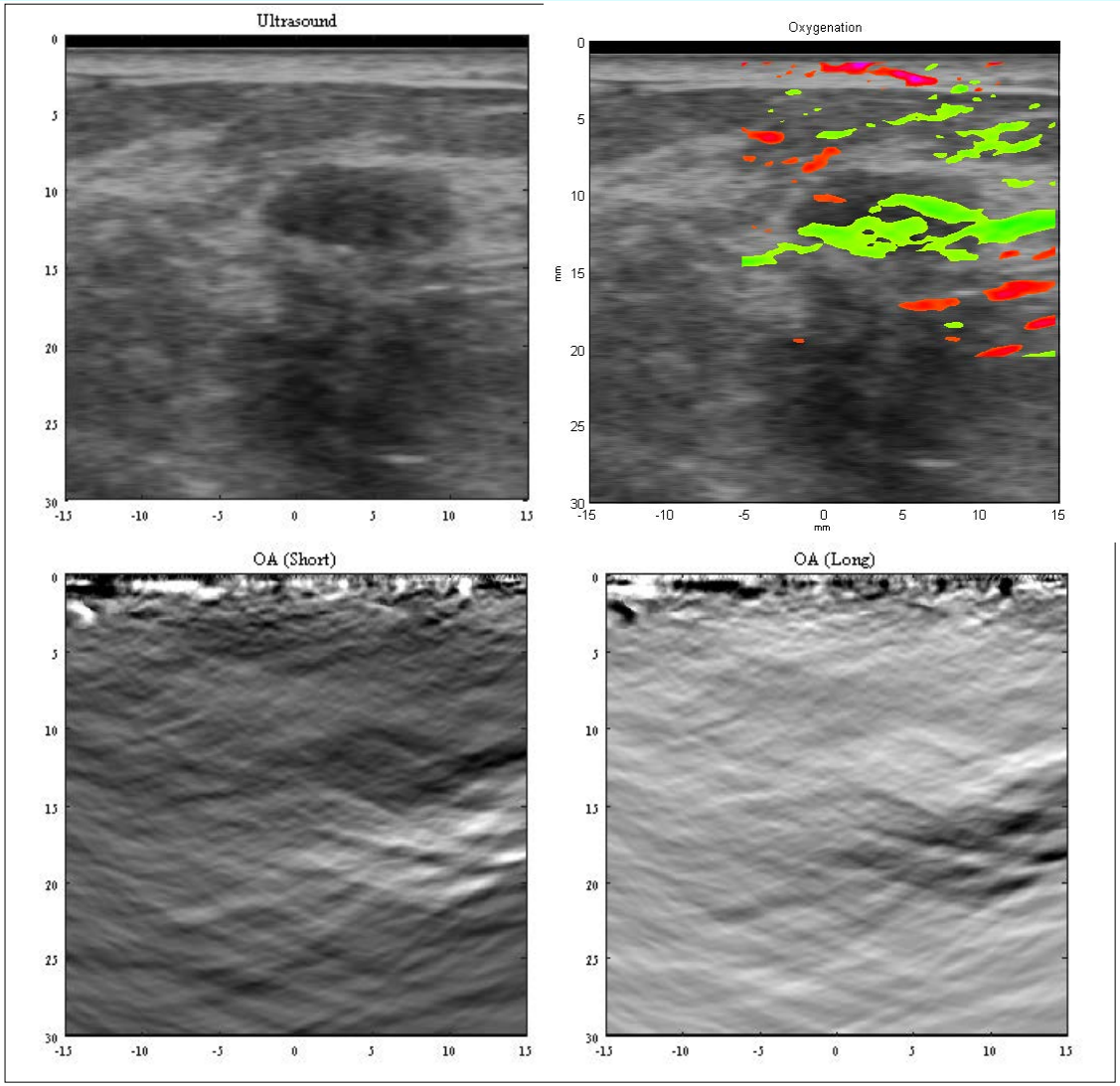


Invasive Ductal Carcinoma

Coregistered Ultrasonic and Optoacoustic Images

Ultrasound

Opto-Acoustic



Benign Fibroadenoma

RESULTS and CONCLUSION
OA Imaging as an Emerging Technology

RESULTS

- 6 tumors identified by mammography and ultrasound as suspicious for malignancy; 3 were confirmed malignant by biopsy.
- 2 out of 3 histologically benign tumors were differentiated as benign with opto-acoustics.
- 3 of 3 carcinomas were correctly identified by opto-acoustics.

Opto-acoustics correctly diagnosed 5 of the 6 lesions.

CONCLUSION

- Opto-acoustic imaging provides additional diagnostic information based on angiogenesis and blood oxygen saturation.
- These data are being used to formulate a multi-center trial.

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