Abstract ID: 17280 Title: Photoacoustic and Ultrasound Imaging Using a Hemispherical Aperture

Purpose:

The aim of our research is to develop a breast cancer screening alternative to x-ray mammography that will improve screening accuracy in women with dense breasts and young women with a predisposition to breast cancer.

Methods:

We have implemented 3D photoacoustic and ultrasound computed tomography using a single transducer array that samples a hemispherical aperture. Such an array samples radial projections though K space uniformly and can produce 3D images that demonstrate nearly isotropic spatial resolution for both photoacoustic and backscattered ultrasound. Data acquisition and image reconstruction strategies will be discussed.

Results:

We have successfully visualized hemoglobin distribution in the breast vasculature of a normal patient. Spatial resolution was better than 0.5 mm and vessels were adequately visualized to a depth of 35 – 40 mm. Microcalcifications as small as 180 microns were visualized in 3D in a breast-tissue-mimicking phantom.

Conclusion:

Hemoglobin and microcalcifications can be imaged in 3D using a single ultrasound detector array that samples a hemispherical aperture. Application of the technology for detecting two biomarkers associated with breast cancer – hemoglobin and microcalcifications - will be discussed.

Educational Objectives:

- Introduce the concept of photoacoustic imaging using ultrasound transducer arrays.
- Discuss data acquisition strategies and reconstruction strategies.
- Discuss photoacoustic contrast mechanisms