AbstractID: 6810 Title: Comparison of Mammographic Percent Density and Volumetric Percent Density Determined from Ultrasound Tomography Images

Purpose:
Previous ultrasound tomography work conducted by our group showed a direct correlation between measured sound speed and physical density *in vitro*, and increased *in vivo* sound speed with increasing mammographic density, a known risk factor for breast cancer. Building on these empirical results, we investigated the use of volumetric ultrasound percent density (USPD) for breast density estimation.

Method and Materials:
A breast phantom comprised of fat inclusions embedded in fibroglandular tissue was scanned four times with both ultrasound tomography and CT. The coronal transmission tomograms and corresponding CT images were analyzed using a semi-automatic segmentation routine. Next, a cohort of ~100 patients was imaged encompassing the entire breast volume (50-75 tomograms/patient). USPD was determined by segmenting high sound speed areas from each slice using a k-means clustering routine, integrating these results over the entire breast, and dividing by total breast area. USPD was evaluated using two mammographic density measures: (1) qualitative, as determined by a radiologist's visual assessment using BI-RADS Criteria and (2) quantitative, via digitization and semi-automatic segmentation of craniocaudal and medio-lateral oblique mammograms.

Results:
The integrated areas of the phantom's fat inclusions were compared using both transmission ultrasound and CT for four repeated scans. The average variability for inclusion segmentation was ~2% and ~10%, respectively, and a close correlation was observed in the integrated areas between the two modalities. A strong positive association between BI-RADS category and USPD was demonstrated. Furthermore, comparing USPD to calculated mammographic density yielded moderate to strong positive associations (Pearson r = 0.76-0.84) for MLO and CC views, respectively.

Conclusion:
These results support the hypothesis that utilizing USPD as an analogue to mammographic breast density is feasible. USPD has the potential to provide a non-ionizing, whole-breast analysis of breast density, which may better elucidate the relationship between breast density and breast cancer risk.