

A comparison of Volpara mammographic breast density with UST sound speed measurements

M Sak¹, N Duric¹, P Littrup¹

Delphinus Medical Technologies, 45525 Grand River Avenue, Novi, MI 48374

Purpose

Ultrasound tomography (UST) produces sound speed maps of breast tissue. Using these images, the volumetrically averaged sound speed can be used as a surrogate of breast density. Volpara produces automated measures of mammographic breast density. A direct comparison between the two measures has yet to be made.

Methods

A cohort of 183 women had received both a UST scan and a Volpara breast density reading of their mammogram. Volpara mammographic measures of percent density and dense volume were recorded from mammographic reports. The whole volume sound speed along with measures of dense volume and UST percent density (USTPD) were measured from the UST ray images using a semi-automated masking algorithm. Corresponding density measures were then compared using standard statistical techniques.

Results

Spearman correlations between the UST and the Volpara density measures ranged from moderate to strong, $r_s = 0.787$ for UST average sound speed vs Volpara PD, $r_s = 0.582$ for USTPD vs Volpara PD and $r_s = 0.410$ for UST vs Volpara dense volume. For some women, there was a significant time delay between the UST scan and the analyzed mammogram so the dataset was filtered such that the UST scan occurred within 100 days of the mammogram. For the 100 scans that fit this time constraint, the Spearman correlations increased, $r_s = 0.836$ for UST average sound speed vs Volpara PD, $r_s = 0.608$ for USTPD vs Volpara PD and $r_s = 0.415$ for UST vs Volpara dense volume.

Conclusion

This preliminary analysis shows that breast density measures made from UST sound speed images and made with Volpara correlate strongly. The relationships between Volpara and UST were stronger than previous results relating UST and mammographic measures made using Cumulus. Additional analysis is still needed to fully explore the relationship between the two breast density measures.

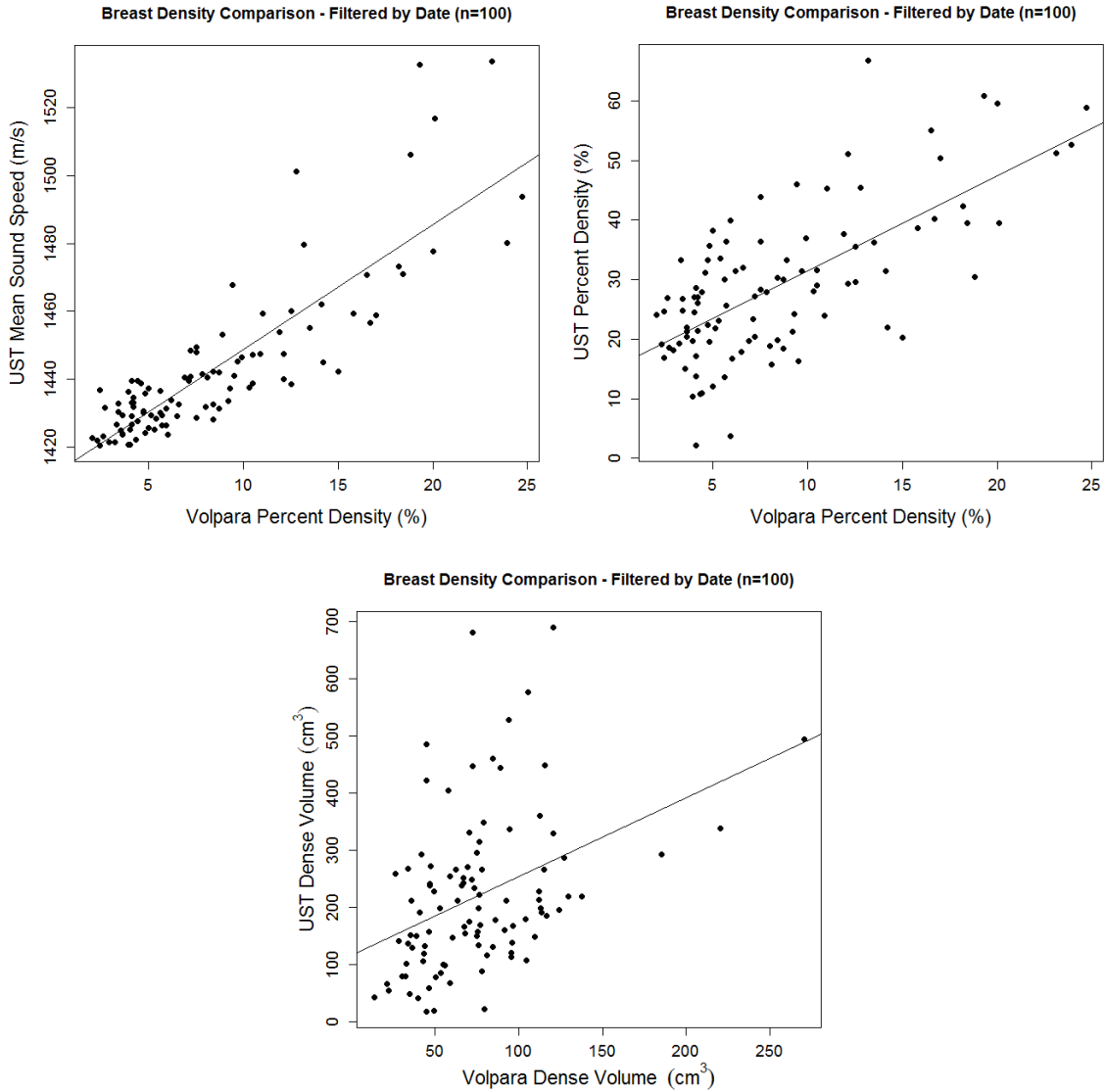


Figure 1 – Scatterplots and the corresponding trendline for the date filtered dataset of the: (Top Left) UST mean sound speed and Volpara percent density measure ($r_s = 0.836$), (Top Right) UST percent density and Volpara percent density ($r_s = 0.608$) and (Bottom) UST and Volpara Dense Volumes ($r_s = 0.415$).