AbstractID: 7531 Title: Ultrasonic scatterer size estimations in liver tumor differentiation

Purpose: To evaluate the utility of an ultrasound scatterer size estimation method (combined with B-mode features) to differentiate liver hemangioma (benign) from malignant liver tumors in a clinical study.

Method and Materials: Scatterer size is estimated from the frequency dependence of the backscatter coefficient, obtained using a reference phantom method. A tissue mimicking phantom containing glass beads randomly distributed in gel was scanned by a Siemens Antares scanner equipped with a linear array transducer to verify the scatterer size data reduction methodology prior to use in clinical determinations. Excised normal human liver tissues and *in vivo* liver hemangiomas and malignant tumors were evaluated using the methodology using either the Siemens Antares or GE Logic 9 scanners. The results were correlated with biopsy findings.

Results: For power spectra estimation, Welch's average approach yields better results than a periodogram and an autoregressive approach. Averaging over 15 independent samples with a gating window length of around 10 wavelengths is desirable to obtain reasonable size estimates based on the trade off between spatial resolution and signal-to-noise ratio. Therefore, angular or elevational compounding was used for *in vivo* data acquisition. A liver hemanigomas exhibited larger effective scatterer sizes than surrounding normal liver tissues. Combining B-mode features, such as a halo sign, with scatterer size estimates may be useful to confirm the benign or malignant classification.

Conclusion: Ultrasound scatterer sizes estimated from frequency dependent backscatter properties may provide useful clinical information, not readily available in conventional ultrasound B-mode images. Preliminary *in vivo* results suggest that it may be an effective processing method for distinguishing liver hemangiomas.