Purpose: A quantitative comparison between echo data from a scanned area in a patient to echo data acquired from a well-characterized reference phantom is an effective means to account for imaging and transducer system dependencies of clinical echo data and to derive back-scatter and attenuation parameters. An assumption in this “reference phantom method” (RPM) is that the speeds of sound (SOS) in the referencel and in the patient are “close.” This study addresses the impact of disparities between SOS's in the sample and reference and possible corrections in the case of errors.

Methods:Phantoms with SOS's of 1500, 1540, and 1580 m/s and approximately 0.59 dB/cm-MHz attenuation coefficients were constructed using gels. They were scanned with array transducers on a Siemens S2000 machine equipped with an ultrasound research interface. Data were acquired both with "BF-sos", the assumed beam former sound speed set at 1540 m/s and with it set to match the sample SOS.

With the 1540 m/s phantom as a reference, echo arrival-time dependent ratios of intensity from phantom and reference were used to compute attenuation coefficients. Processing was done using a) no adjustments to the signal vs. time data, b) SOS based adjustments so ratios were computed from precisely the same depth, and c) data with BF-sos matching the SOS of the sample.

Results:Variations are seen in attenuation coefficient estimates when the sample and reference phantom have SOS values that differ by the amounts used here. Improvements are noted when data are properly matched depth-wise. Best results are obtained when this is done AND the BF-sos matches the sound speed in the sample.

Conclusions:Differences between a medium's SOS and that assumed in the beam former result in errors in attenuation measurements. Errors are minimized by matching the sound speed of the beam former with the SOS of medium.

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