

The Contribution of Density Fluctuations in Ultrasound Scattering in Cancellous Bone

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Abstract : An understanding of the interaction between acoustic waves and cancellous bone is needed in order to realize the full clinical potential of ultrasonic bone measurements. Scattering is likely to be of central importance but has received little attention to date. Few theoretical approaches have been described to explain scattering of ultrasound from bone. In this study, a scattering model based on velocity and density fluctuations in a binary mixture (marrow fat and cortical matrix) was used to estimate the ultrasonic attenuation in cancellous bone as a function of volume fraction. Predicted attenuation and backscatter coefficient were obtained for a range of porosities and scatterer size. At 600 kHz and for different scatterer size the effect of velocity and density fluctuations in the predicted attenuation was approximately 60% higher than velocity fluctuations.

Keywords : ultrasound scattering, sound speed, density fluctuations, attenuation coefficient

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