

The Bone Specific Surface of cortical bone and its influence on the Spatio-temporal Evolution of Cortical Porosity during Osteoporosis

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Bone cells are well-known to be regulated biochemically and biomechanically. The notion that the microscopic availability of bone surface affects bone remodeling is, however, less established. Bone-resorbing and bone-forming cells require a bone surface to attach to and initiate the matrix renewal. For bone a characteristic relationship between porosity and specific surface has previously been proposed based on 2D histological measurements. In this paper we will first use 3D data derived from micro-CT of human cortical bone to establish the relationship between porosity and specific surface and compare these results with those reported in the literature. Secondly we will utilize a computational model of bone remodeling to investigate how porosity evolves in osteoporosis across a cortical bone section. Using this methodology we investigate the different mechanisms driving osteoporosis and their impact on the spatio-temporal changes in cortical porosity.