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Identification of the Orthotropic Parameters of Cortical Bone under Nanoindentation

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Abstract : A good understanding of the mechanical properties of the bone implies a better understanding of its various diseases, such as osteoporosis. Berkovich nanoindentation tests were performed on the human cortical bone to extract its orthotropic parameters. The nanoindentation experiments were then simulated by the finite element method. Different configurations of interactions between the tip indenter and the bone were simulated. The orthotropic parameters of the material were identified by the inverse method for each configuration. The friction effect on the bone mechanical properties was then discussed. It was found that the inverse method using the finite element method is a very efficient method to predict the mechanical behavior of the bone.

Keywords : mechanical behavior of bone, nanoindentation, finite element analysis, inverse optimization approaches
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