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Finite element analysis of tibia with osteogenesis imperfecta : The influence of considering cancellous bone in model reconstruction (Article)

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Abstract

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The paper aims to develop the finite element (FE) models of tibia with Osteogenesis Imperfecta (OI) based on a patient-specific computed tomography (CT)-images. Two types of FE model have been developed. The first model was set the tibia bone as a single solid model whereas the second model consists of cortical bone and cancellous bone. The developed FE models were used for FE analysis using Voxelcon under various loadings, and then the results of the different models were compared. It was found that the single model yields relatively in agreement to piecewise model, with percentage different of below than 2% for all loading conditions. It seems that the reconstructed FE model considering the cancellous bone did not give significant effect compared to the solid model that neglecting the microstructure of cancellous bone. Hence, we can conclude that the single solid FE model with OI has predicted well, at least for the present boundary conditions, although the cancellous bone was neglected in the model reconstruction.
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