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Biophysical Analysis of Tibia Using Computational Simulations

WOOYOUNG CHOI, JINPYO HONG, SEIYOON OH, CRG-Choice Research Group — High compressive forces can cause severe stresses on the tibial bone. Repetitive loads applied to the upper surface of the tibial bone can lead to dangerous bone damage. To reduce the undesirable effect, the tibial bone and its joint need to be analyzed using biomechanical simulation before its empirical experiment. Mathematical and physical model of a two-dimensional bone model of the tibia is useful to study bone stress and fracture analysis. In this paper, MRI scanning of the tibia was studied using physical and mathematical methods. Computational approach to enhance the quality of the image was carried out for the analysis of various cases. Also, removal of ringing artifact in the magnetic resonance image using Fourier transform and mathematical morphology was presented. To improve the resolution of the tibia from low contrast MRI films, high pass filter and re-designed filter were used, achieving a good tradeoff between the code running time and resolution of the MRI image of the tibia.

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