A Finite Element Analysis of a Human Foot Model to Simulate Neutral Standing on Ground

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ABSTRACT
The objective of the paper is to perform finite element analysis of a human foot model to study the dynamic behavior and the internal loading conditions during neutral standing on the planar ground. The foot structure is simulated to assist in the design of an instrumented shoe insole. Finite element model of a human foot was generated and the loading condition during neutral standing was used to evaluate the stress distribution. The comprehensive stress distribution of the human foot model subjected to several loading conditions can be specified by a computational model. The method of the research is by using computational tomography data of the bone and soft tissue structures of a human foot in developing a 3-D finite element foot model. An analysis was conducted to simulate the loading condition of human foot during neutral standing. A commercial CAD software package was used to generate the boundary surfaces and the solid models of all model components. The numerical stress analyses for the neutral standing of the foot model was done using a commercial finite element software package. Peak pressures were seen at the first metatarsal, fifth metatarsal, and under the heel. The foot plantar deformation of the neutral standing foot model was seen similar to the finite element foot model in previous literature. The present study offers a prior computational model, which is capable of estimating the comprehensive plantar pressure and is intended to aid researchers in investigating foot plantar pressure as well as to develop custom-made insoles.

KEYWORDS: Foot modeling; plantar pressure; finite element; force distribution

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