Relationship between morphology of the ankle joint complex and its mechanics revealed through subject-specific models

Carl W. Imhauser1, Sorin Siegler2, Jayaram K. Udupa3, Jason H. Toy2

1Biomedical Mechanics and Materials, Hospital for Special Surgery, New York, NY; 2Mechanical Engineering and Mechanics, Drexel University, Philadelphia, PA; 3Radiology, University of Pennsylvania Medical Center, Philadelphia, PA

imhauserc@hss.edu

Introduction: The morphology of the bones, articular surfaces1 and ligaments,2 and the mechanical characteristics3 of the ankle joint complex (AJC) vary greatly among individuals. The morphological variations may influence the outcome of surgeries that alter native AJC morphology, such as joint fusion, joint replacement or osteotomies. It might also predispose certain individuals to injuries, such as ankle sprain or chronic conditions such as subtalar joint instability1. The goal of this study was to investigate, using a numerical modeling approach, the relationship between variations in morphology and variations in mechanical behavior of the ankle complex. The main hypothesis was that the variations observed in the passive mechanical properties of the healthy ankle complex are the result of variations in ankle joint complex morphology.

Materials and Methods: Six 3D dynamic models of the AJC were developed from morphological data obtained from MRI of six lower limbs (Fig. 1)

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