

Interspecies variation of compressive biomechanical properties of the meniscus.

Abstract

Various animal models have been used to investigate the normal and reparative properties of the knee meniscus. Yet, only limited data on meniscal biomechanical properties of various animals are available. It was therefore the objective of this study to compare measurements of meniscal biomechanical properties between six species: human, bovine, monkey, canine, sheep, and porcine. Uniaxial confined compression tests were conducted on 1-mm-thick, 4-mm-diameter meniscal discs, and the viscoelastic creep deformation was obtained. Two biomechanical parameters, the aggregate modulus (HA) and permeability (K), were found by implementing the linear biphasic theory and a newly developed nonlinear regression scheme. A one-way analysis of variance was conducted along with Student-Newman-Keuls comparison tests to assess the differences in these parameters among the species. Sheep menisci exhibited HA and K values most similar to human menisci. The water content of each specimen was also measured and correlated significantly with K. The interspecies variations found in material properties of the knee meniscus indicate the need for caution in extrapolating data on the biomechanical behavior of the human meniscus from animal models.