The relationship between three-dimensional, MRI-based morphologic measurements commonly taken of knee cartilage was examined to determine whether a subset of variables fully reflects differences observed in cartilage in cross-sectional and longitudinal studies. The benefits of a subset of measures include increased statistical power due to reduced multiple comparisons, improved understanding of relationships between the morphologic measures of articular knee cartilage, and greater efficiency in reporting results. One hundred fifty-two women (77 healthy and 75 with knee osteoarthritis) had coronal 3-T MR images of the knee acquired at baseline and at 24 months. Measures of femorotibial cartilage morphology (surface area, thickness, volume, etc.) were determined in the medial and lateral tibia and femur. Cartilage thickness (mean cartilage thickness over the total area of the [subchondral] bone), total subchondral bone area, and percentage of denuded area of the subchondral bone were found to explain over 90% of the cross-sectional and longitudinal variation observed in other measures of cartilage morphology commonly reported in knee osteoarthritis. Hence, these three measures of cartilage morphology explain nearly all variation...
in a larger set of common cartilage morphology measures both cross-sectionally and longitudinally, both in healthy and in osteoarthritic knees. These variables hence define an efficient subset for describing structural status and change in osteoarthritic cartilage.