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A new mechanical indentation framework for functional assessment of articular cartilage

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Abstract

The conventional mechanical properties of articular cartilage, such as compressive stiffness, have been shown to have limited capacity to distinguish visually normal from degraded cartilage samples. In this study, a new mechanical indentation framework for assessing functional properties of articular cartilage during loading/unloading, i.e. deformation and recovery, was established. The capacity of a ring-shaped indenter integrated with an ultrasound transducer to distinguish mechanically intact from proteoglycan-depleted tissue was investigated. To achieve this, normal and enzymatically degraded bovine osteochondral samples were subjected to loading/unloading while the response of the tissue at the middle was captured by ultrasound at the same time. The enzymatic degradation model was characterized by amount of proteoglycan content, glycosaminoglycan release and proteomic analysis. The mechanical response of a wider continuum of articular cartilage in the loaded area and its surrounding region was captured in this

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[1] Authors contributed to this work equally.