

ACorner@IST

January 9, 2024, 3:30 pm

Sala de Reuniões do Pav. Central

## Articular Cartilage Shear and Tensile Properties in the Context of Tissue Wear

### Markus A. Wimmer

Department of Orthopedic Surgery, Rush University Medical Center, Chicago (IL), USA

<https://cartilage.org/member/wimmer-markus/>

<https://www.rushu.rush.edu/faculty/markus-wimmer-phd>



Historically, osteoarthritis (OA) has been considered a disease of ‘cartilage wear and tear’. It is now well-established that OA is not simply a disease of tissue wear, but a multifactorial problem involving biological and mechanical mechanisms. Yet, knowledge of how OA leads to loss of mechanical tissue competence will provide additional perspective in the understanding of disease progression. The objective of the present study was to use oscillatory sinusoidal shear to further investigate tissue behavior under various compressive strains. Since the disruption of the collagen network of the superficial zone is observed as a major event in early osteoarthritis, we studied intact cartilage samples and damaged samples with removed superficial zone. We first hypothesized that compressive strain affects shear behavior protecting the tissue from micro-damage, and

that the superficial zone plays a significant role in the protection of cartilage against tissue damage. Second, we were interested in the depth-dependent tensile properties of the tissue, since tensile stress can lead to rupture of collagen fibers. While work has been performed to capture tensile properties, a thorough depth dependent analysis has not been done, primarily due to constraints in sample geometry. Here, we decreased the thickness of cartilage samples and thus increased the spatial resolution to include all zones of cartilage.

Moderadora: **Ana Paula Serro** (DEQ – IST; <https://fenix.tecnico.ulisboa.pt/homepage/ist134419>)