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Sub-Critical Impact Inhibits the Lubricating Mechanisms of Articular Cartilage

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Abstract

Although post-traumatic osteoarthritis accounts for a significant proportion of all osteoarthritis, the understanding of both biological and mechanical phenomena that lead to cartilage degeneration in the years to decades after trauma is still lacking. In this study, we evaluate how cartilage lubrication is altered after a sub-critical impact (i.e., an impact to the cartilage surface that produces surface cracking but not full thickness fissuring). Through utilizing a Stribeck-like framework, the elastoviscous transition, we evaluated changes to both the innate boundary lubricating ability of cartilage after impact and also the effectiveness of high viscosity lubricants to lower friction after impact. Increases in boundary friction coincided with changes in lubricin localization after impact. However, larger increases in friction coefficient were observed in mixed-mode lubrication which can be predicted by increases in surface roughness due to

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