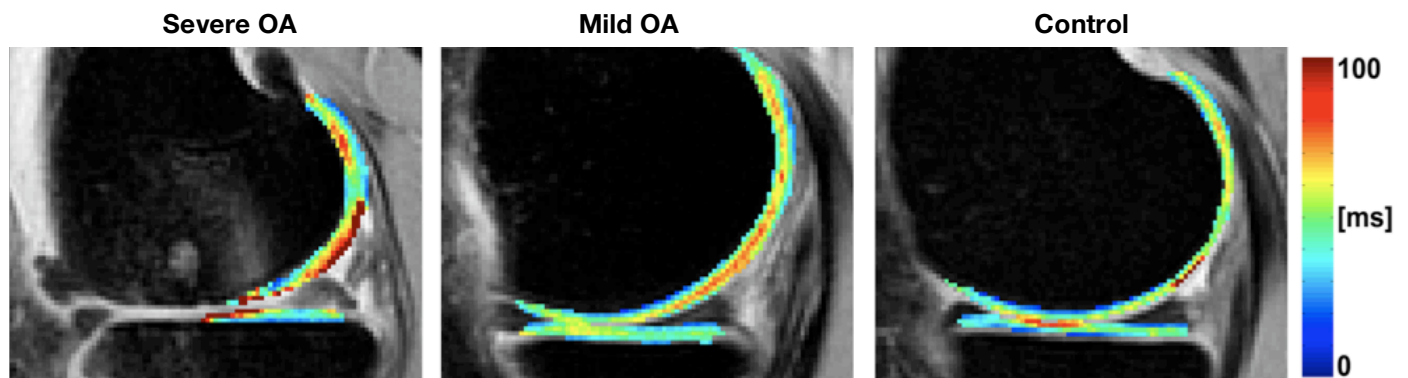


Characterizing the spatial distribution of cartilage T_2 using texture analysis

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Quantitative T_2 relaxation time has been used as a noninvasive marker of cartilage degeneration, as it is sensitive to tissue hydration and biochemical composition. In early cartilage degeneration, changes in the extracellular matrix (e.g., disorganization and breakdown of collagen network) increase the mobility of water, thus increasing T_2 relaxation time. Previous studies have demonstrated elevated T_2 relaxation time in osteoarthritis (OA) subjects as compared to healthy subjects, have reported spatial variations in T_2 values from the radial zone to the articular cartilage surface, and have shown different visual patterns of T_2 values in pre-arthritic, early arthritic and healthy hip cartilage. These results demonstrate that the spatial distribution of cartilage T_2 values reflect the biochemical changes in OA. Our research aims to quantify the spatial distribution of cartilage T_2 values using grey level co-occurrence matrix (GLCM) texture analysis. We aim to characterize the spatial distribution of cartilage T_2 in OA patients and age-matched healthy subjects and to analyze the longitudinal changes in the texture of cartilage T_2 . The figure below shows representative cartilage T_2 maps from a patient with severe OA, mild OA and a control. Visually, the spatial distribution of cartilage T_2 pixels is more heterogeneous in the OA patients.



Representative T_2 colormaps overlaid on T_2 -weighted images of a severe OA patient (left), a mild OA patient (center) and a control subject (right). The OA patients both have greater entropy and lower angular second moment (ASM) than the control subject.