# The Effect of Freezing on Surface T2 Measurements in Articular Cartilage

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In clinical and experimental studies, cartilage is often stored by freezing, yet the effects of freezing on the MR characteristics of the collagenous network are unclear.1,2 The purpose of this study was to evaluate the effect of freezing on T2 at the articular surface, where collagen fibre orientation can be predicted based on the local split line pattern.

Method: The surfaces of bovine articular cartilage samples were pricked with a pin dipped in a cocktail of India Ink and MR contrast agent producing split lines. Samples were imaged with a 9.4T horizontal magnet (Bruker), with slices selected through rows of split lines. Regions between parallel split lines were used for analysis. Samples were wrapped in parafilm and imaged at 0 and 90 degrees with respect to B0 (TE/TR=7/2500ms, 256x256, FOV=22.5 x 22.5mm). Samples were wrapped in PBS-soaked gauze and frozen at -20oC for 16 hours. Samples were then thawed at room temperature, and re-imaged. T2 maps were calculated using a mono-exponential estimation, and T2 profiles through cartilage depthwere produced.

Results and Discussion: T2 at the surface was longer for split lines oriented at 0 degrees to B0 compared to those oriented at 90 degrees. In both fresh and frozen conditions, T2 changes predictably as a function of surface collagen orientation, yet T2 decreased after freezing. This study demonstrates that freezing and thawing of articular cartilage alters the characteristic T2 signal in MRI, which reinforces the importance of using unfrozen cartilage samples for MRI studies of joint pathology.

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