Oral PO-7

(10:00 - 10:10)

Quantitative MRI for physiological analysis in articular cartilage

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Purpose: The many tissue parameters that can be measured by MTI techniques have the potential to provide physiologic information about the repair or transplant as well. Because contrast is a measurement of the difference in signal between two regions, a measurement of contrast is independent of any arbitrary image scale factor.

Material and Method: Good morphologic evaluation of cartilage and chondral pathology is achieved with (1) proton-density (PD) and T2-weighted fast spin echo (FSE) and (2) 3D spoiled gradient echo (SPGR) sequences. The 3D fast low-angle shot (FLASH) sequence visualizes cartilage similarly as the SPGR sequence. In our experience fat suppression is helpful to visualize cartilage pathology. While 3D SPGR and FLASH sequences are well suited to depict surface lesions, PD-w and T2-w also show cartilage internal pathology due to the more intermediate signal of the cartilage in these sequences.

Result: Because MTR seems to be a very unstable parameter to characterize magnetization transfer, many attempts have been made to find another more uniform parameter. The parameters that determine the MTR values can be classified in tissue properties. The fact that different tissues exhibit different degrees of magnetization transfer provides the rationale for using these techniques. However, the uncertain relationship between tissue properties and MTR complicates the process of standardization and it is not yet possible to predict the behavior of individual tissues in different MR systems. Low MTR can arise from several physical (tissue) properties: for example a reduced capacity of the macromolecules in articular cartilage to exchange magnetization with the surrounding water molecules or a decreased amount of macromolecules. Several studies are done that give evidence that decreased MTR values may reflect demyelination or axonal loss.

Conclusion: Investigation of physical basis of MTR and evaluation of the widely used SPGR scanning technique, as done in this study with an experimental and theoretical approach, can provide us more insight in the physical and technical basis of magnetization transfer imaging. In the future, this could be of considerable interest for the quantification of glycosamineglycan(GAG) in articular cartilage.

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