

Saturday, February 13, 2010

Yang Xia Studies Magnetic Resonance Imaging

Good science requires attention to details. For instance, Professor of Physics and CBR member **Yang Xia** recently pulished a paper in the January 2010 issue journal **Magnetic Resonance in Medicine (Volume 63, Pages 25-32)** about a specific measurement method in **magnetic resonance imaging**. The introduction begins

"As one of the three major molecular components (water, **collagen**, and **proteoglycan**) in articular **cartilage**, proteoglycans play a critical role in maintaining the mechanical stiffness of the tissue because they have heavily sulfated side chains of **glycosaminoglycan** (GAG), which carry a high concentration of negative charges, contributing to the stiffness of the tissue. Several experimental methods in MRI have been proposed to detect the loss of GAG, which is regarded as one of the early signs of the tissue degradation leading to the clinical diseases such as **osteoarthritis**. Among these methods, a proton-based MRI method by Bashir et al. (1) could measure the GAG concentration in articular cartilage by the administration of **paramagnetic** contrast agent, **gadolinium diethylene triamine pentaacetic acid** ($\text{Gd}(\text{DTPA})^{2-}$). The central concept of this method is that since $\text{Gd}(\text{DTPA})^{2-}$ is negatively charged, the contrast agent will distribute itself within articular cartilage in a spatially inverse relationship to the concentration of the negatively charged GAG molecules. Since gadolinium (Gd^{3+}) is a paramagnetic ion and its presence in the tissue will reduce the **T1 relaxation** of proton, a map of GAG concentration in cartilage can be constructed based on two T1 maps, one before and one after the Gd administration. This method has been termed delayed gadolinium-enhanced MRI of cartilage (dGEMRIC) in clinical MRI literature (2–7)."

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SUMMARY

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