Hyperpolarized metabolic MR in the study of cardiac function and disease - DTU Orbit (08/11/2017)

Hyperpolarized metabolic MR in the study of cardiac function and disease

Several diseases of the heart have been linked to an insufficient ability to generate enough energy (ATP) to sustain proper heart function. Hyperpolarized magnetic resonance (MR) is a novel technique that can visualize and quantify myocardial energy metabolism. Hyperpolarization enhances the MR signal from a biological molecule of interest by more than 10,000 times, making it possible to measure its cellular uptake and conversion in specific enzymatic pathways in real time. We review the role of hyperpolarized MR in identifying changes in cardiac metabolism in vivo, and present the extensive literature on hyperpolarized pyruvate that has been used to characterize cardiac disease in various in vivo models, such as myocardial ischemia, hypertension, diabetes, hyperthyroidism and heart failure. The technical aspects of the technique are presented as well as the challenges of translating the technique into clinical practice. Hyperpolarized MR has the prospect of transforming diagnostic cardiology by offering new insights into cardiac disease and potentially even to contribute to personalized therapy based on a thorough understanding of the individual intracellular metabolism.

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