Chemical Exchange Saturation Transfer (CEST) MRI of the liver

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Background: Chemical exchange saturation transfer (CEST) MRI allows the indirect detection of exogeneous or endogenous compounds in living tissue. The technique exploits the proton transfer of these compounds with the abundant water pool to achieve a signal amplification of up to 3 orders of magnitude compared to MR spectroscopy. The most used and best studied CEST effect is the one of amide protons of mobile proteins and peptides. This so-called Amide Proton Tranfser-weigted (APTw) contrast was shown to add value in the diagnosis of neurodegenerative diseases, cancer diagnosis and assessment of treatment response, and many more diseases coming along with pathological alterations. However, CEST MRI signals are corrupted by the tissue's relaxation time, experimental imperfections, and patient motion, which all must be assessed and corrected for in order to obtain isolated CEST effects.

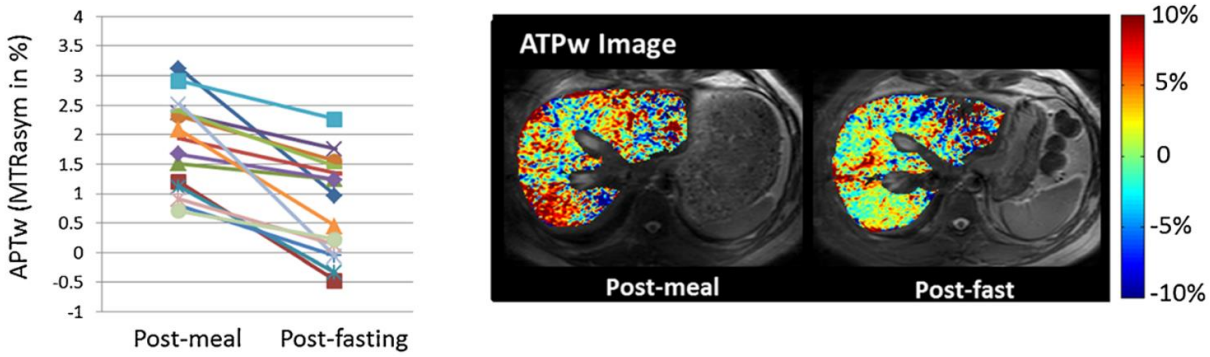

Figure 1: CEST MRI study of 15 healthy volunteers at 3 T showing a high sensitivity of CEST MRI towards liver composition changes between after-meal and over-night-fast status. Figure from Deng, M. et al. Mol. Imaging Biol. ***18**, 274–82 (2016).*

Hypothesis: Relaxation-compensated and inhomogeneity corrected CEST MRI allows to detect changes of hepatic glycogen level und thus enables the diagnosis and assessment of pathological changes of the human liver in diseases like liver fibrosis.

Methods: In this project, we want to implement and optimize a protocol for relaxation-compensated and inhomogeneity corrected CEST MRI and combine it with previously developed motion correction approaches to enable robust CEST MRI of the human liver at clinical field strengths.

Collaboration: The PhD students will work closely with other BIOQIC projects investigating other imaging approaches of the human liver (e.g., MR Elastography or PET-MRI). Other BIOQIC projects will benefit from the methods developed here.

Impact: The methods developed within this project will enable accurate and reproducible CEST measurements in the human liver providing clinicians with a novel diagnostic tool for diseases like fibrosis or cancer.

Please contact Patrick Schünke (patrick.schuenke@ptb.de) for any further questions on this project.