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mDIXON being developed to simplify and accelerate liver MRI

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PHILIPS
sense and simplicity

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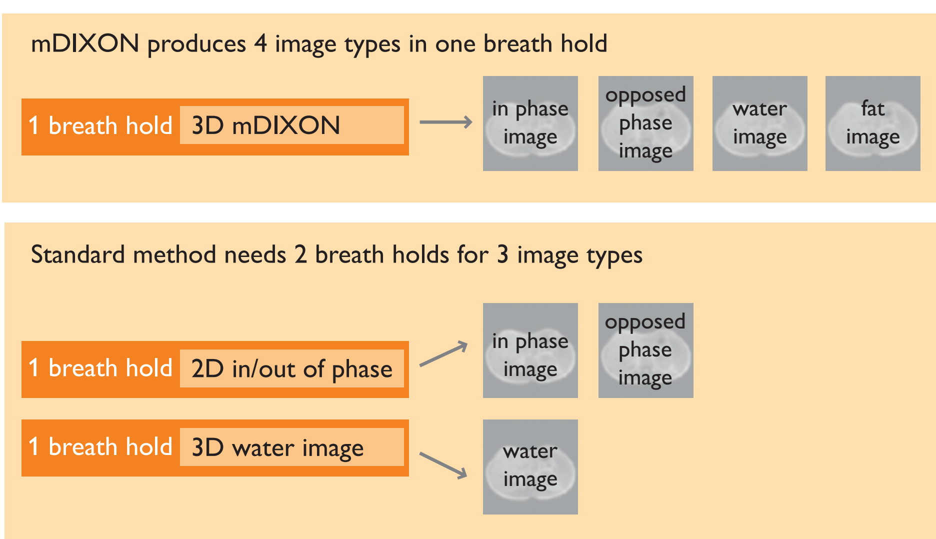
A liver MRI exam typically includes T2-weighted imaging, chemical shift imaging, pre-contrast T1-weighted, and dynamic post-contrast imaging. Currently, three separate scans are required to create these four image datasets. The mDIXON sequence is being developed to provide four image types in one breath hold: water and fat images as well as in-phase and opposed-phase images.

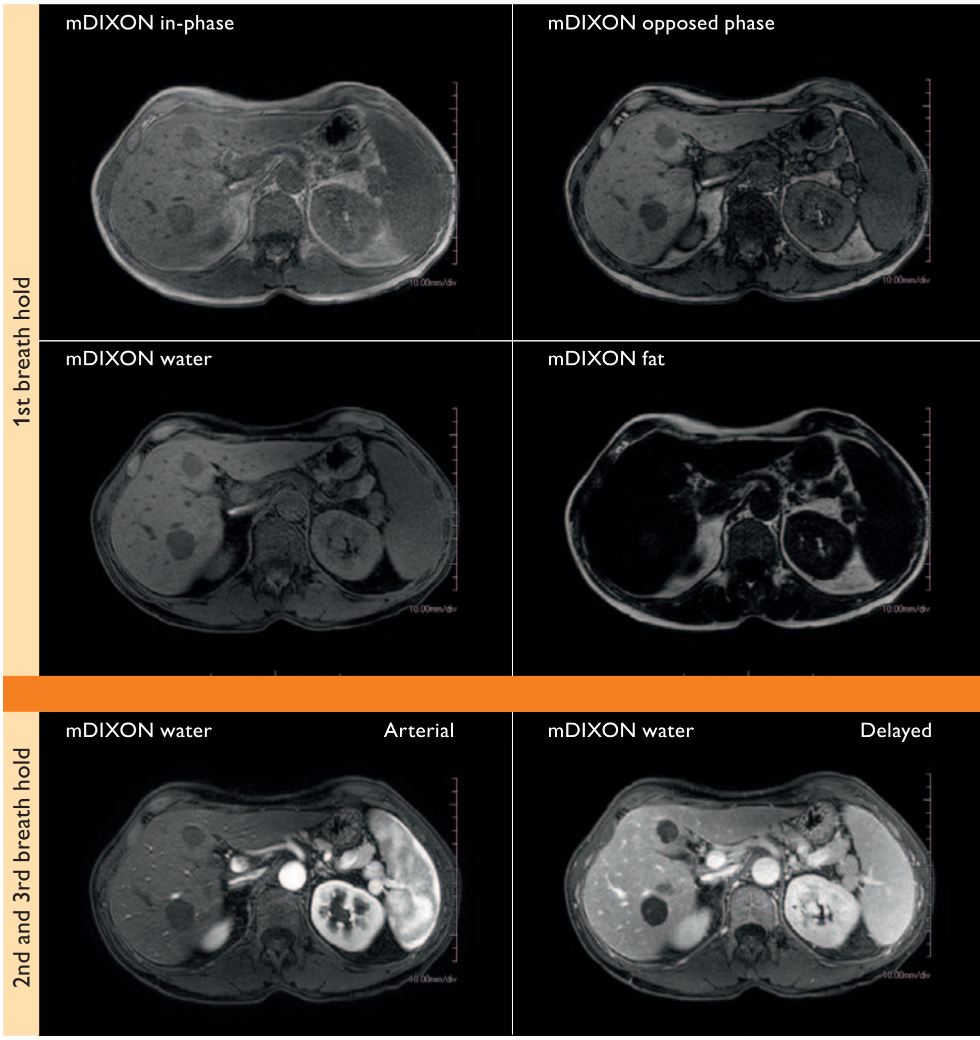
The mDIXON sequence is being developed to provide the same images as the pre-contrast and chemical shift sequences, in only one single scan that fits in a breath hold of about 20 seconds. Because this mDIXON scan is designed to be faster, it allows using higher in-plane and through-plane spatial resolution within one breath hold. Shahid Hussain, MD, PhD, University of Nebraska Medical Center, USA and Thomas Perkins, PhD, Senior Clinical Scientist at Philips, are cooperating to optimize the mDIXON sequence for liver MRI.

Philips mDIXON differs from previous Dixon techniques

The original Dixon technique requires a time-consuming acquisition of in-phase and opposed-phase gradient echo images. The in-phase and opposed-phase images are then added together to get water-only images, and subtracted to get fat-only images. These imaging sequences have limited possibilities to simultaneously optimize for spatial resolution, slice thickness, and scan time, and still fit in a single breath hold in the case of liver imaging. The Philips mDIXON sequence is based on a unique reconstruction algorithm, offering

Schematic comparison of mDIXON and standard methods.





mDIXON in liver

Four different image types are obtained with mDIXON in a patient with two liver lesions. The 3D axial 2-point multi-echo FFE mDIXON scan was performed in one breath hold using the Achieva 3.0T TX with MultiTransmit and the 16-channel SENSE Torso coil.

freedom in echo time setting, so that it does allow for optimization of key imaging parameters and still fits in one breath hold. Arbitrary echo times are used to generate reconstructed water-only images, fat-only images, in-phase images and opposed-phase images.

Time-consuming fat-suppression RF pulses are not needed, and this gain in speed allows to select better spatial resolution for mDIXON than for e-THRIVE within the same breath hold time. In addition, mDIXON performs a special optimization designed to obtain more uniform fat suppression than with e-THRIVE. On 3.0T systems, a two-point mDIXON sequence may be ideal, because at higher field strengths, the frequency difference between fat and water increases, shortening the fat-water amplitude modulation period such that the two acquired mDIXON echo times can be short, thus enabling a higher data sampling rate.

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