In vivo magnetization transfer of liver at 3T

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Introduction

Magnetization transfer (MT) imaging of liver has been shown to be of clinical diagnostic value at low fields *(1)*. Such image acquisition can be difficult to achieve because typical MT sequences require long scan times and can be hindered by breathing artifacts. Attempts have been made to report MT ratio (MTR) values for ex vivo animal liver at 3T *(2)* and fatty versus normal for in vivo animal liver at lower fields *(3)*, however in vivo liver MTR values have not been fully established at 3T. In vivo MT imaging of the liver might be accomplished without SAR issues using a breath-hold segmented MT (BhSegMT) sequence. To test the practicality of this method of MT imaging, we compared BhSegMT to non-segmented MT (nsMT) imaging strategies to determine a normal human liver MTR value in vivo.

Materials and methods

Abdomen images from five normal volunteers under IRB approval were collected to compare MTR values for normal liver at 3T. Images were acquired on a Philips 3.0 Tesla system (Philips Medical Systems, Best, NL) using the Philips cardiac SENSE coil. The nsMT images were collected using a 3D T1w FFE Philips MTC/MTR sequence and required 4:08 min for 10 slices. The BhSegMT images were collected using a TFE with TFE factor 13, TR 4.0 ms, TE 1.9 ms, 10º flip angle, and 25.8 secs for 10 slices. The rest of the parameters for the BhSegMT sequence were the same as the nsMT sequence. The sequence was optimized using phantom and brain images for greatest retention of transfer. MTR maps were calculated using Philips Viewforum MT analysis tool.

Results

Figure 1 shows the MT-pulsed liver image acquired with the nsMT sequence (a) and the BhSegMT sequence (b). This figure illustrates the difficulties of acquiring dynamic images, such as MT images, in the liver because of breathing artifacts that conceal and distort the regions of interest. An nsMT sequence with four averages (not shown) showed similar results. Thus, a breath hold MT sequence is ideal to ensure high-quality and quantitative MTR maps of the liver. The average normal liver MTR value from the five volunteers was 18.5% ± 2.8%. These values were well below the values found in *(1)* for ex vivo rabbit liver tissue, however the BhSegMT results are true in vivo MTR values and may more accurately reflect the MTR values for human liver. The variation of the BhSegMT values is consistent with the variation reported in *(2)* for fatty and control in vivo rabbit liver tissue.

Discussion

A breath-hold segmented MT strategy is presented that provides a method to collect MTR images of the liver with decreased imaging time, no increase in SAR and no breathing artifacts. This imaging scheme gives consistent MTR values for the liver and can be used to cover the entire liver using a series of BhSegMT scans. Further characterization of diffuse and focal liver diseases using these MTR sequence may allow early detection and may potentially monitor therapy.

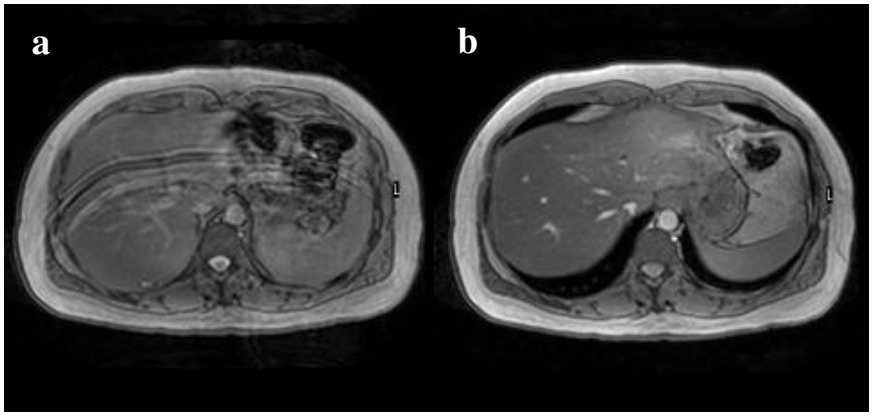

Figure 1. *nsMT (a) and BhSegMT (b) MT-pulsed images of a normal human liver.*

References

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