Effect of fat deposition in the liver on multi-parametric quantitative values at 3.0T MRI

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Target Audience: Radiologists who are interested in quantitative MRI of the liver.

Purpose: Quantitative MRI such as relaxometry, diffusion weighted image and MR elastography (MRE) is widely used for the objective evaluation of both diffuse and focal liver lesions. In this study, we tried to assess the effect of fat deposition in the liver (Lfat) on multi-parametric MRI values at 3.0T MRI.

Materials and Methods: Sixty healthy volunteers (Age, 37.8 ± 12.5 year; male:female, 44:16) without liver disease were prospectively enrolled and underwent MRI at 3.0T MR system. Lfat was measured by modified Dixon method 3D FFE sequences (TR/TE1, 3.3ms/1.2ms; slice thickness (ST), 2mm). In all patients, T1 (Lock-Locker sequences; TR/TE, 10ms/0.8ms; 16 phases; ST, 8mm), T2 (TSE sequence; TR, 500ms; 8 echoes with interval of 12ms; ST, 8mm), and T2* (FFE sequence; TR/TE, 200ms/2.8ms; 17 echoes with interval of 2.7ms; ST, 5mm) relaxometry, DWI (b=0,50,400,800; TR/TE, 1579ms/58ms; ST, 5mm) and multi-frequency MRE (transducer frequency, 28Hz/56Hz/84Hz; 3D gradient FFE sequence; TR/TE, 75.8ms/6.7ms; ST, 4mm) were acquired. Pearson correlation coefficient was calculated for evaluating the relationship between BMI and Lfat and between Lfat and multi-parametric MRI values.

Results: There was a significant positive correlation between BMI and Lfat (Pearson correlation coefficient = 0.566, P<0.001). There was a significant positive correlation between T2 value and Lfat (0.684, P<0.001) and a week negative correlation between T2* value and Lfat (-0.283, P=0.028). However, there was no significant correlation between T1 value and Lfat, Between ADC and Lfat, and between all MRE modulus (shear, loss and complex modulus) and Lfat in all three transducer frequencies (P >0.05).

Conclusion: Lfat can affect T2 and T2* values. Hence, Lfat should be adjusted when T2/T2* values are used as quantitative parameter for the evaluation of focal or diffuse liver disease.

Figure: There was a significant difference between BMI and Lfat, and between T2/T2* values and Lfat.