INTRODUCTION:
To evaluate the liver metabolism, $T_2^*$-IDEAL [1, 2] is useful for assessment when there is co-occurrence of hepatic steatosis and iron deposition, but this method is not necessarily implemented in standard MR imagers. Thus, we devised a method for analyzing $R_2^*$ (iron content), and fat fraction of the liver tissue simultaneously using modulus and real multiple gradient-echo (MRM-GRE) sequence [3, 4].

METHODS:
On a 1.5-T MRI, modulus images of seven gradient-echoes (2.1, 3.7, 5.3, 6.9, 8.5, 10.1, 11.7 ms) were obtained by MRM-GRE sequence at a time. A real part of the first echo image was also reconstructed to differentiate below and above the 50 percent fat fraction. The fat fraction and $R_2^*$ were obtained from the parameters of a theoretically fitted formula with each echo signal. $R_2^*$ and fat fraction were measured with MRM-GRE in the phantom (changing fat and iron content, respectively) and the liver in normal volunteers (control group; n=10) and patients with fatty liver (n=5).

RESULTS AND DISCUSSION:
$R_2^*$ value of the phantom showed a strongly positive correlation with the actual iron content (Fig. 1), and MRI-derived fat fraction of the phantom was in good agreement with the actual value (Fig. 2). MRI-derived fat fraction in fatty liver was significantly higher than that in the control group (Fig. 3). However, no significant difference in $R_2^*$ values was found between fatty liver and control groups. These results show that the MRM-GRE enables to differentiate the causes of signal reduction whether increasing $R_2^*$, i.e., increasing iron content (hemochromatosis) or increasing fat fraction (fatty liver).

CONCLUSION:
The MRM-GRE method makes it possible to simply and accurately assess the fat content and the iron content. The ability to obtain both of them at the same time allows us to optimize the advantages of each and thereby obtain more information about the liver metabolism.

REFERENCES: