Liver Enzyme Levels and Hepatic Iron Content in Fatty Liver: 
A Noninvasive Assessment in General Population by T2* Mapping

Amir Reza Radmard, MD, Hossein Poustchi, MD, PhD, Mehrdad Dadgostar, PhD, Ali Younessi, MD, PhD, Soheil Kooraki, MD, Elham Jafari, MD, Amir Pejman Hashemi Taheri, MD, Reza Malekzadeh, MD, Shahin Merat, MD

Rationale and Objectives: Existing evidence suggests potential contribution of iron in pathogenesis of nonalcoholic fatty liver disease (NAFLD). We aimed to investigate whether hepatic iron content correlates with liver enzyme levels in NAFLD using a noninvasive magnetic resonance imaging (MRI) technique.

Materials and Methods: Subjects from Golestan Cohort Study were randomly selected. Diagnosis of NAFLD was made by combination of ultrasound and MRI. Subjects with NAFLD were divided into two groups with high (H-NAFLD) and low (L-NAFLD) enzyme level according to 95th percentile of alanine aminotransferase (ALT) value in normal population. Quantitative T2* maps of entire cross-sectional area of liver were calculated on pixel-by-pixel basis using a semiautomated software.

Results: A total of 207 subjects were enrolled. Mean T2* values were significantly lower in NAFLD group than controls (P < .001) indicating higher iron content. Male subjects with H-NAFLD had statistically lower T2* values than those with L-NAFLD in multivariate analysis (odds ratio, 0.74; 95% confidence interval [CI], 0.58–0.95), whereas this was not observed in women. Unlike women, there was significant negative correlation between ALT levels and T2* values in men with H-NAFLD (r = −0.66, P = .01). Every 1-millisecond decrement in T2* value was associated with 6.37 IU/L increase in ALT level (95% CI, 1.8–10.9, P = .01) in men with H-NAFLD.

Conclusions: Higher hepatic iron in men with H-NAFLD, estimated by T2* mapping, may support the role of iron in possible progression of simple steatosis to nonalcoholic steatohepatitis. Lack of such correlation in women could be attributed to relatively lower iron storage or other mechanisms rather than iron.

Key Words: Hepatic iron; nonalcoholic fatty liver disease; T2* mapping; serum transaminase.

©AUR, 2015

Nonalcoholic fatty liver disease (NAFLD) is a common cause of chronic liver disease, which is strongly associated with features of metabolic syndrome (1). Nonalcoholic steatohepatitis (NASH) is the severe form of NAFLD, which has a multifactorial etiologic model. Excess iron deposition has been proposed as one of the potential contributing factors in pathogenesis of NASH, which can complicate simple steatosis via the production of reactive oxygen species (ROS) (2). Iron may also have a role in mechanisms other than ROS formation including altered insulin signaling and lipid metabolism. Consequently, iron may contribute not only to NASH progression but also to the initial development of steatosis (3).

A number of studies have investigated the relationship between NAFLD and liver iron by demonstrating the presence of stainable hepatic iron deposit (4). However the results of these studies, which were obtained from specimens of liver biopsy, are conflicting as some support the association of hepatic iron deposition with more advanced NASH (5), whereas others do not (6). Although biopsy is the gold standard for evaluation of liver disease, it is an invasive procedure, which is subject to sampling error or nonhomogeneous distribution of liver injuries (7,8). Moreover, it cannot be used in population-based studies for both ethical and practical reasons.

Magnetic resonance imaging (MRI) is a rapid and noninvasive alternative to liver biopsy for quantification of steatosis and liver iron content (9,10). Recently, a tremendous progress in quantification of intracellular hepatic fat by MRI has provided a cost-effective and accurate diagnostic modality.