Liver MRI: How I Do It.

MRI of Diffuse Liver Disorders:

Hero K. Hussain, MD
Department of Radiology/MRI. University of Michigan, Ann Arbor, USA

MRI is utilized as a first line imaging modality for the assessment of diffuse liver disease. We will discuss the role of MRI in the evaluation of 3 chronic diffuse liver conditions: Fatty liver, iron deposition and cirrhosis.

Fatty liver: Fatty liver disease is a major cause of chronic liver disease in adults and children. In the USA, Non-alcoholic fatty liver disease (NAFLD) is suspected to surpass chronic hepatitis C as the main cause for end-stage liver disease. NAFLD comprises a spectrum of pathologies that range from simple steatosis through steatohepatitis to cirrhosis. Hepatic steatosis is also associated with higher cardiovascular morbidity and mortality. Histopathologically, hepatic fat is the hallmark of NAFLD and can be used as a surrogate marker to determine severity of disease and response to therapy. MRI has the potential to replace standard liver biopsy for the assessment of hepatic fat. Chemical-shift based MRI techniques and MR spectroscopy have been used to accurately quantify hepatic fat. Confounding factors such as T1 effect, T2* decay, ambiguity of the dominant constituent, and spectral complexity of fat need to be addressed in order to accurately estimate the "hepatic fat fraction"

Iron deposition: Categorized as primary (genetic) or secondary, dependent on the cause. In genetic hemochromatosis, iron deposits in parenchymal cells and can lead to cirrhosis and related complications. In secondary iron deposition disorders related to either ineffective erythropoiesis or excessive transfusions, iron deposits in reticuloendothelial cells. MRI has the potential to replace liver biopsy for the detection of hepatic iron and monitoring response to treatment. Gradient-echo imaging with multiple echo-times (TEs) is used to assess the degree of iron overload, which can be calculated from the rate of signal loss (T2*) as a function of TE.

Cirrhosis: Hepatic fibrosis is induced by a non specific inflammatory response to various etiologies. Fibrosis can progress to cirrhosis and subsequently to end-stage liver disease. Therefore, early detection and treatment of hepatic fibrosis is important to prevent this progression. MR elastography (MRE) is a promising technique for the detection of early fibrosis and has the potential to replace liver biopsy. MRE is used to evalaute tissue stiffness by acquiring MR images that depict the propagation of mechanically induced shear waves in tissues and generating quantitative maps of tissue stiffness called elastograms.

In established cirrhosis, MR has a well-defined role in the assessment of malignant and non malignant complications including the detection and staging of hepatocellular carcinoma and cholangiocarcinoma, and the evaluation of portal hypertension.