# Liver Fat Quantification – Seriously, Who Cares?

Session: Quantitative Biomarkers in Liver MRI: How to Use Them in the Real World

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Objectives: To gain an improved understanding of current and short-term future clinical applications for liver fat quantification techniques.

Key points:

1. MRI-based liver fat quantification using measures of proton density fat fraction (PDFF) may play a supportive role in the work-up of fatty liver disease. However, liver fat content does not distinguish non-alcoholic fatty liver (NAFL) from non-alcoholic steatohepatitis (NASH), and thus may not contribute to clinical decision-making.
2. In clinical trials of medications to treat NASH, PDFF is being used as a marker of change in disease in response to medication.
3. Because pediatric NAFL is relatively uncommon, PDFF may play a role in the diagnosis of pediatric NASH. PDFF may have a secondary role in evaluating overweight children.

Summary:

The development of MRI-based measures of liver fat (PDFF) has received great attention in the last 10 years. Although MRS-based measures have been long been feasible, MRI has the advantages related to whole-liver imaging and greater distributability. These techniques are now available from the major MRI vendors and are being offered by a variety of imaging labs for use in multi-center clinical trials.

Much of the excitement around PDFF measures was motivated by the rising prevalence of non-alcoholic steatohepatitis (NASH), a metabolic disease characterized by abnormal triglyceride (fat) deposition in the liver which leads to liver inflammation, fibrosis, cirrhosis, and ultimately liver failure and/or liver cancer. It was hoped that measures of PDFF would be helpful in the diagnosis and characterization of NASH, and in particular the differentiation between NASH and non-alcoholic fatty liver (NAFL), a state in which abnormal triglyceride deposition is present in the liver, but the downstream effects which lead to morbidity and mortality do not develop.

Unfortunately, it has been shown that liver fat content is a poor differentiator for the question of NAFL vs. NASH. As a result, enthusiasm from clinical referrers for PDFF measurements in patients with suspected NASH has decreased. However, PDFF measures have found utility in clinical trials of medications for NASH, as indicators of

alterations of the natural history of the disease. The role of PDFF measures in the clinical care of patients with NALF and NASH has yet to be clearly defined.

While NAFL is very common in adults, it is a relatively rare condition in children. In children, the presence of fatty liver is typically pathological and related to obesity, metabolic syndrome, and poor health outcomes. Insulin resistence, and by extension diabetes, has also been shown to be correlated with changes in liver fat levels. In addition, there is greater reticence to perform liver biopsy in children compared to adults. Thus a tool which can non-invasively detect the presence of abnormal hepatic steatosis in children may be of great value.

Traditionally, the treatment of NASH was primarily by lifestyle modification. While this remains the first-line option, there are a number of medications under evaluation as second-line treatments. Since their effectiveness likely depends on a variety of patient factors, PDFF measurements may serve as useful non-invasive markers of disease modification and treatment efficacy. While still under evaluation, this is a potentially high-impact future use for PDFF.