SCBT•MR
Society of Computed Body Tomography & Magnetic Resonance

2013 Scientific Sessions
Saturday, October 12, 2013
1:00 – 5:00 p.m.

Presenter: Kevin Zand, M.D.

Title of Abstract: **Accuracy of Multi-echo Magnitude-based MRI (M-MRI) for Estimation of Hepatic Proton Density Fat Fraction (PDFF) in Children**

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Modality: MR

Organ System: GI

Intro: Hepatic proton density fat fraction (PDFF) is an MR-based standardized, reproducible biomarker of liver fat content.

Purpose: To assess the accuracy of multi-echo magnitude-based MRI (M-MRI) for estimation of hepatic proton density fat fraction (PDFF) using co-localized MR Spectroscopy-measured PDFF (MRS-PDFF) as the reference standard.

Methods Used: This single-center, retrospective, cross-sectional, IRB-approved, HIPAA-compliant study was conducted from August 2008 to May 2013. Three hundred sixty-five children (ages 8–20 [mean 14.3], 241 males) underwent research MR examinations of the liver. Two-dimensional unenhanced axial images were obtained at 3T using a spoiled gradient-recalled-echo sequence with low flip angle (10°) and TR ≥ 120ms to minimize T1 dependence. PDFF maps were generated offline from source images pixel-by-pixel with a reconstruction algorithm that corrects for T2* signal decay and multi-frequency interference effects of fat. Circular regions of interest were manually placed on the liver on three consecutive slices co-localized to the MRS voxel. M-MRI-PDFF accuracy was assessed using linear regression, modeling MRS-PDFF (reference standard) as a function of MRI-PDFF. Four regression parameters served as metrics of accuracy: regression intercept, regression slope, R2, and average bias. 95% confidence intervals were computed for each parameter estimate. Mean M-MRI-PDFF and MRS-PDFF values were compared (paired t-test).

Results of Abstract: M-MRI and MRS-PDFF ranges (mean, SD) were -0.7 – 41.3% (12.29, 9.7) and 0.2 – 40.6% (13.24, 9.6) respectively. The regression intercept, slope, R2, and average bias were 1.147 (95% CI: 0.957, 1.336), 0.984 (0.972, 0.996), 0.986 (0.983, 0.988), and 0.958 (0.846, 1.070), respectively. On average M-MRI-PDFF underestimated MRS-PDFF by 0.95% ($p < 0.0001$).

Discussion: In children and using MRS as the reference standard, M-MRI accurately estimates hepatic PDFF with only a small relatively constant underestimation of ~1%. Further research is needed to determine the cause of and correct this underestimation.

Scientific and/or Clinical Significance? There is insufficient data on MRI in children to recommend its use for hepatic fat quantification in the pediatric age group. This study helps to address this gap in knowledge by providing data on a large cohort of children.

Relationship to existing work This is the first scientific study in our knowledge to assess the accuracy of MRI for estimation of hepatic PDFF in a large cohort of children.