Purpose:To detect, separate, and quantify more cerebral metabolites than is currently possible with one-dimensional magnetic resonance spectroscopy (1D MRS) by using 2D localized correlated spectroscopy (2D L-COSY) with prior-knowledge fitting algorithm (ProFit).

Methods:14 patients with minimal hepatic encephalopathy (MHE) (mean age ± standard deviation (SD) = 53.3±10.6 years) and 18 control subjects (52.7±12.6 years) were studied with 1.5T GE MR Scanner. A body coil for transmission and a 3-inch surface coil for reception were used. A localizer followed by high-resolution T1-weighted axial images (TR/TE = 800/8 ms, 35 slices, 4 mm thickness with no gap) were collected. We used a CHESS sequence for water suppression. 2D L-COSY spectra were recorded using the following parameters: TE = 30 ms; TR = 2000 ms; total number of scans = 768 (96 Δt1 increments and 8 averages per Δt1); and spectral width, F1 = 625 Hz and F2 = 2500 Hz. A 27ml voxel was placed on the anterior cingulate gyrus. A battery of neuropsychological tests (NP) was done to correlate the MRS results with the NP data.

Results:: The 2D L-COSY data processed with the ProFit was able to separate and quantify fourteen cerebral metabolites in both healthy controls and patients as opposed to five with 1DMRS. The ratios of myoinositol (mI), glutamate (Glu), total choline, scyllo-inositol (sI), phosphoethanolamine (PE), and total NAA with respect to creatine (Cr) showed a statistically significant decline in patients compared to healthy controls whereas the ratio of glutamine to Cr (Gln/Cr) was significantly increased.

Conclusions:Our technique allows for separation and quantitation of Glu from Gln, strengthening the astrocyte-ammonia detoxification hypothesis in HE. In addition, clear separation of glycerol-phosphocholine (GPC) from total choline in conjunction with the decline in PE, points to a decrease in phospholipid metabolism in HE.

Funding Support, Disclosures, and Conflict of Interest:

This research was supported by National Institute of Mental Health (NIMH) grant #1R01MH06569501A1