

# 1H MRS Detects Bilateral Abnormalities in Hippocampus of Temporal Lobe Epilepsy Patients

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**Introduction:** Magnetic resonance spectroscopy (MRS) studies have shown that decreased NAA/Cr ratio in temporal lobe epilepsy (TLE) patients correlated with neuronal loss and/or gliosis in seizure foci. However, there are no consistent metabolic abnormalities found in the contralateral hippocampus. The purpose of this study was to evaluate the metabolic status of hippocampus sclerosis (HS).

**Methods:** Single voxel <sup>1</sup>H MRS was performed on both hippocampus of 8 healthy subjects and 8 patients with refractory TLE, who were pathological confirmed hippocampus sclerosis. Volume of interest (VOI) = 8 cm<sup>3</sup>. Two VOIs were placed bilaterally in the mesial temporal area. TR/TE = 2000/135 ms. Areas under the peak of NAA, Cr and Cho were measured, and the ratios of NAA/Cr, Cho/Cr, and NAA/Cr+Cho were calculated.

**Results:** The average ratios of NAA/Cr, Cho/Cr and NAA/Cr+Cho were 1.58, 1.06 and 0.77, respectively, in control subjects (Table 1). Low NAA peak was seen in the affected temporal lobe (Figure 1). NAA/Cr ratio decreased significantly in ipsilateral hippocampus compared to those in contralateral sides and control subjects (P < 0.01). Cho/Cr values increased in both ipsi- and contralateral hippocampus in compared with those in control subjects (P < 0.01). NAA/Cr+Cho ratio, however, significantly reduced in both ipsi- and contralateral hippocampus (P < 0.01). Seizure foci had lower NAA/Cr+Cho ratio than contralateral hippocampus, but the difference did not reach statistical significance.

**Discussion:** NAA is considered as a marker of viable neurons, and Cho a membrane turnover chemical. Reduced NAA/Cr and increased Cho/Cr levels in the affected hippocampus were consistent with neuron loss and gliosis in the surgical resected epileptogenic foci. Contralateral hippocampus had significant higher Cho/Cr and lower NAA/Cr+Cho values compared to control subjects, suggesting repeated seizure activity may cause reactive astrocytosis on both hippocampus. NAA/Cr ratio, on the other hand, showed no difference between contralateral hippocampus and control subjects, indicating that there might be no neuron loss in the contralateral side of the seizure focus.

**Conclusion:** <sup>1</sup>H MRS was sensitive to detect metabolic abnormality on both hippocampus of TLE patients, which provided important biochemistry evidence to understand the pathological changes in the contralateral hippocampus.

## References:

1. Connelly A, et al. Neurology 1998;51:61-66
2. Lee SK, et al. Neuroradiology 2005;47:916-923

Table 1: Metabolic status of hippocampus in HS patients and control subjects.

Hippocampus	NAA/Cr	Cho/Cr	NAA/Cr+Cho
Ipsilateral	1.17 ± 0.08	1.38 ± 0.08	0.55 ± 0.04
Contralateral	1.52 ± 0.09	1.42 ± 0.10	0.63 ± 0.02
Controls	1.58 ± 0.06	1.06 ± 0.06	0.77 ± 0.03

