Cortical Atrophy in First-Degree Asymptomatic Relatives of Temporal Lobe Epilepsy Patients

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Introduction: It is already known that patients with Temporal Lobe Epilepsy (TLE) have cortical abnormalities related to hippocampal sclerosis. Newly, studies have aimed to investigate the heritability as an important factor in structural alterations in TLE patients[1]. There has been a search for a biomarker that proves the familial role in the TLE; therefore, quantitative MRI studies have been used to evaluate cortical alterations in their asymptomatic relatives[2].

Materials and Methods: Fifty-eight asymptomatic first-degree relatives of TLE patients from Unicamp's Epilepsy Service were invited; they were free from any neurologic disease, and have never presented seizures. For group comparisons, sixty-nine healthy controls were selected from an MRI bank of healthy volunteers. Images were acquired at Hospital de Clínicas (Unicamp) using a 3 Tesla Philips MRI scanner including 3D-T1 weighted images (WI) (isotropic voxels of 1 mm^3, acquired in the sagittal plane; 1 mm thick, flip angle=8^o, TR= 7ms, TE 3,2ms, FOV= 240 x 240 x 180 mm^3). All images were segmented according to standard SPM12/CAT 12 protocol (http://www.neuro.uni-jena.de/cat/) (www.fil.ion.ucl.ac.uk), which included: spatial normalization [MNI-152], tissue segmentation and smoothing, Quality control of image segmentation was performed. Statistical analyses of images were performed with SPM12, while clinical information was compared with Social Sciences (SPSS 23).

Results: Group of relatives and controls were balanced regarding gender (p= 0.9) and age (p=0.13). The Figure below shows significant reduction of cortical thickness on family members compared to healthy controls (p<0.01, uncorrected for multiple comparisons).

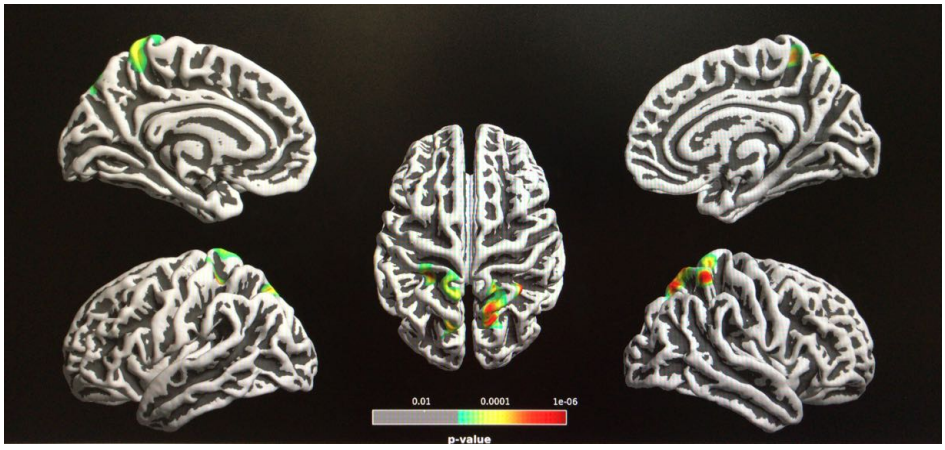

Figure 1: Atrophy was concentrated on left postcentral gyrus, bilateral parietal superior gyrus and precuneus.

Discussion: The morphologic changes observed in asymptomatic family suggest some degree of genetic influence over cortical thickness atrophy of TLE patients. It is possible that genetic determinants of neuronal migration during brain maturation (or early environmental factors) are somehow abnormally expressed in both patients and their relatives, resulting in alterations of surface area and cortical thickness [3,4,5,6].

Conclusion: Areas of atrophy identified in first-degree relatives of TLE patients strongly suggest a heritable condition/trait. Further studies of brain connectivity with fMRI (Functional MRI) and Diffusion images may reveal subtle alterations to corroborate this hypothesis.

References: [1] Whelan CD et al .Epilepsia56(10): 1551-1561, 2015; [2] Scanlon C et al. J Neuroimaging 23: 64-70, 2013. [3] Armstrong E et al. Cereb Cortex 5:56-63, 1995. [4] Panizzon MS et al. 19:2728-2735, 2009. [5] Berkovic SF, Scheffer IE. Curr Opin Neurol. 12:177-182, 1999. [6] Kobayashi E et al. Arch Neurol 59: 1891-1894, 2002.