

Laymen's Summary - Writing Assignment - Sofía Gutiérrez Santamaría

Title – Additional value of Magnetic Resonance Spectroscopy for epilepsy diagnostics in the normal appearing epileptogenic zone

Background – Epilepsy is a disease in which three conditions have to be met: at least two unprovoked seizures occurring more than 24 hours apart; one unprovoked seizure and a probability of further seizures similar to the general recurrence risk (at least 60%) after two unprovoked seizures, occurring over the next 10 years; and diagnosis of an epilepsy syndrome. The aetiology of epilepsy depends on the age groups. While in children the most common causes of seizures are genetic, injury due to perinatal insults, and malformations of cortical development; in adults the causes are encephalitis/meningitis, traumatic brain injury, and brain tumours. This disease affects 50 million people worldwide approximately, thus it is considered one of the most common neurological diseases.

Methods – Neuroimaging plays an essential role in the evaluation of epilepsy. Although CT scans are typically the first modality used to detect the underlying cause of an epileptic seizure, they are likely to miss the majority of the epileptogenic lesions. Therefore, other imaging modalities are used to detect the cause of epilepsy. MRI is generally performed; however, it only identifies structural pathology in the epileptic brain in one third of the epileptic patients. For that reason, MRS is a promising tool in the detection of the normal appearing epileptogenic zone. This modality detects abnormalities that are invisible to a conventional MRI because metabolic abnormalities often precede structural changes.

Results – TLE is the most common form of focal epilepsy in which about 20% of patients have negative structural MR images. The majority of the reviewed studies confirm that NAA, Cr and Cho are the most commonly used metabolites to identify the epileptogenic zone in MRI negative TLE and ETLE. Moreover, NAA/Cr, NAA/Cho and NAA/(Cr+Cho) are the most widely accepted ratios for lateralization of the normal appearing epileptogenic zone. Furthermore, NAA and MI have been reported as the metabolites that best enable the study of seizure spread. In addition, the majority of studies agree that the single-voxel MRS approach limits its ability to provide help in MRI-negative patients with unclear seizure onset, since it requires a priori hypothesis of the epileptogenic focus. Nonetheless, some disadvantages such as long acquisition time, poor homogeneous shimming, imperfect water suppression, deficient quality spectra and time-consuming post-processing make multi-voxel MRS rarely employed.

Conclusion – MRS is a very promising tool in the identification and lateralization of the epileptogenic focus in MRI-negative scans. Further progress in obtaining improved magnetic field homogeneity, faster shimming and post-processing and high-quality spectroscopy data will make this modality an indispensable to diagnose epilepsy in the normal appearing epileptogenic zone.