

Title: Resection of ictal high frequency oscillations is associated with favorable surgical outcome in pediatric drug resistant epilepsy secondary to tuberous sclerosis complex.

Author(s): Fujiwara H, Leach JL, Greiner HM, Holland-Bouley KD, Rose DF, Arthur T, Mangano FT

Journal name: Epilepsy Research

DOI: 10.1016/j.eplepsyres.2016.07.005

What is the topic?

Tuberous sclerosis complex (TSC) is a syndrome that is characterized by the presence of benign tubers in multiple parts of the body. A vast majority of individuals with TSC exhibit seizures, and a proportion of these individuals do not respond to conventional anti-seizure medications. In these cases, resection (i.e. removal of the part of the brain that produces seizures) is helpful in reducing seizure frequency. Since most people with TSC have multiple tubers, it is difficult to decide what tuber is causing the seizure activity and should be removed. The thought in the field is that in such cases, the biggest tubers should be resected. However, a subset of people with TSC does not show one dominant tuber, and conventional MRI and EEG are not able to guide surgeons as to what tuber to remove.

Studies have found that high frequency oscillations (HFOs) which are waveforms in the brain 80Hz and above give a good indication about the seizure-onset zone in children and adults with epilepsy. The authors of this study wanted to know whether HFOs can be used in TSC as well as a marker to guide surgery.

What did the researchers hope to learn?

By examining the intracranial EEG data of children with TSC and refractory epilepsy, the researchers wanted to know if HFOs can be a more sensitive marker of the seizure-onset zone. If so, HFOs can be used to guide resection surgery in addition to already available techniques. Intracranial EEG is a technique done to demarcate the area of the brain that produces seizures.

Who was studied?

Fourteen children with TSC and refractory (drug resistant) epilepsy were studied. Children were of ages 2 to 16 years.

How was the study conducted?

The researchers implanted EEG electrodes in the subdural space of children and studied HFO waveforms. Resection surgery was conducted, and post-operative follow-up was done. The researchers took the HFO data, and examined whether HFOs correlate to MRI findings and to clinical outcome after surgery.

What did the researchers find?

All children in this study had HFOs during the start of the seizure. The exciting finding was that irrespective of the MRI findings, removal of the area that caused the HFOs led to a better outcome. Another way of saying this is that regardless of the way the tubers looked, complete resection of the part of the brain that produced HFOs was linked to better clinical outcome.

What were the limitations of the study?

There are technical challenges with using intracranial EEG recording – the number of electrodes in the grid is limited, and it could be that the researchers failed to get a complete picture of where HFOs were arising from.

What do the results mean for you?

Just as is the case with seizures without TSC, even in seizures with TSC, HFOs are a good biomarker of the epileptogenic zone. This study found that complete resection of the HFO-producing area led to best clinical outcome. Hence, it could be that larger resections aren't necessarily better, but complete removal of the HFO-producing structure is more reliable and desirable.

This summary was written by Sloka Iyengar, PhD- a neuroscientist and science writer based in New York (September 2016).