

RESEARCH/PROJECT NAME: Role of Magnetic Source Imaging (MSI) in “Non-Lesional” Neocortical Pediatric Epilepsy

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CURRENT STATUS: Ongoing

OVERALL GOAL: Improve the accuracy of localization of epileptogenic zone of “non-lesional” patients with non-invasive neuroimaging tools

PROJECT SUMMARY: About 25 to 30 % of the epilepsy patients are refractory to medical treatment, resective epilepsy surgery is the most likely option for focal epilepsy. After failing 2 anti-epileptic medications, early epilepsy surgery evaluation should benefit patients. Identifying the epileptogenic zone is the key to better surgical outcome. Patients with a lesion such as, tumor, mesial temporal sclerosis or other lesion on MRI are usually associated with good surgical outcome. However, non-lesional neocortical epilepsy is usually associated with a poor surgical outcome. One of the reasons is the difficulty to define the epileptogenic zone. It is almost inevitable that invasive EEG will be utilized for further evaluation of the potential surgical candidates. Magnetoencephalography (MEG)/MSI is a non-invasive tool measuring the subtle magnetic fields generated by neurons. After (MEG) / MSI becomes available clinically, it has been applied more frequently to identify the epileptogenic zone in this group of patients. Twelve “non-lesional” pediatric patients with MSI study were evaluated, 8 patients underwent invasive EEG recording, 6 patients underwent resective surgery. With the guidance of MSI, the patients’ MRIs were reevaluated. Four patients were re-categorized as lesional. Three patients were decided not to be good surgical candidates, because MSI and/or invasive EEG recording demonstrated the epileptogenic zone is overlapped with eloquent functional cortex or too diffuse to perform surgical resection. Among the 6 patients undergone resective surgery, 5 patients have been seizure free, the other one has 80% seizure reduction (7 months to 8 years, median 56.5 months follow-up).

With the limited data, we conclude that MSI is a valuable test in non-lesional neocortical epilepsy for presurgical evaluation. “Non-lesional” epilepsy patients may be re-categorized to “lesional” guided by MSI, it may also improve invasive electrode placement or in some cases guide the surgery directly. Invasive evaluation might be avoided when MSI indicates a patient to be a non-surgical candidate.