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Title: MR-guided stereotactic laser ablation of epileptogenic foci in children

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What is the topic?

Anti-epileptic drugs (AEDs) are the first line of treatment for epilepsy, but one-third of the population does not respond to these drugs. Alternative options for individuals with refractory epilepsy are dietary therapy (e.g., the ketogenic diet) and surgical removal of the epileptic focus (the part of the brain where seizures originate). One of the ways of removing (ablating) the tissue that causes seizures is by magnetic resonance imaging (MRI) - guided ablation of laser interstitial thermal therapy (shortened to 'MRgLITT'). In this paper, the scientists wanted to test the efficacy of MRgLITT in children that had epilepsy.

What did the researchers hope to learn?

Individuals with epilepsy where two AEDs have failed to provide seizure control are known as 'refractory' cases. In this study, the researchers wanted to know whether MRgLITT would be able to provide seizure relief in pediatric patients with refractory epilepsy. Basically, MRgLITT is a way of destroying the epileptic tissue using laser; MRI allows one to see in real-time and with great accuracy the part of the brain being destroyed by the laser. One advantage of this technique is that it is minimally invasive (as compared to resection surgery without laser).

Who was studied?

This retrospective study was performed in 5 children with refractory epilepsy. 'Retrospective' means that the technique (MRgLITT) was performed and the efficacy in reducing seizure frequency was studied after the fact.

How was the study conducted?

Since the patients were children, consent was taken from their guardians. Past reports had already given an indication of where the seizures were originating from (this was different for each patient). On the day of the MRgLITT surgery, a flexible probe with laser was inserted into the area that needed to be ablated. After this, the patient was transferred to the MRI area where by a special software; the physician could monitor temperature changes caused by the laser. Special temperature maps in addition to MRI allowed physicians to keep track of what tissue was being destroyed – only the tissue that was generating seizures needs to be destroyed, keeping effect on surrounding healthy tissue minimal. Once the epileptic focus is sufficiently destroyed, the incision that was made to insert the laser probe can be closed. Patients were followed up after MRgLITT to observe whether seizures had reduced in frequency.

What did the researchers find?

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Follow-up studies found that all patients were seizure-free after MRgLITT procedure. At least in the first few months that the patients were followed, there were no complications because of the ablation technique either. Previous studies have found usefulness of MRI-guided laser ablation for brain tumors, but this is among the first studies that observed its usefulness in refractory epilepsy.

What were the limitations of the study?

One limitation of the study is the small sample size. However, the results seen are an impetus to perform a bigger study with more patients. Post-operative follow-up was done for a short time (i.e. 13 months); observing the effects of MRI-guided laser ablation years down the line would be quite beneficial.

What do the results mean for you?

A big issue in epilepsy research (and a goal of epilepsy researchers) is to better understand the mechanisms underlying refractory epilepsy, and the possible ways to provide seizure relief in cases where AEDs fail to provide relief. The results of this study suggest that MRI-guided laser ablation may be able to reduce seizures in difficult-to-treat cases.

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*This summary was written by Sloka Iyengar, PhD, epilepsy researcher and science writer (March 2015).*