

# Successful Outcomes of Robotic-assisted S-EEG Placement and Laser Ablation in Patients with Intractable Epilepsy

Rady Children's Hospital-San Diego  
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Rady Children's Hospital-San Diego is one of the highest volume pediatric centers for using therapeutic thermal laser ablations in patients with medically intractable epilepsy. Over the past four years, the [Division of Neurosurgery](#) has performed 10 to 20 laser ablations per year, with excellent outcomes.

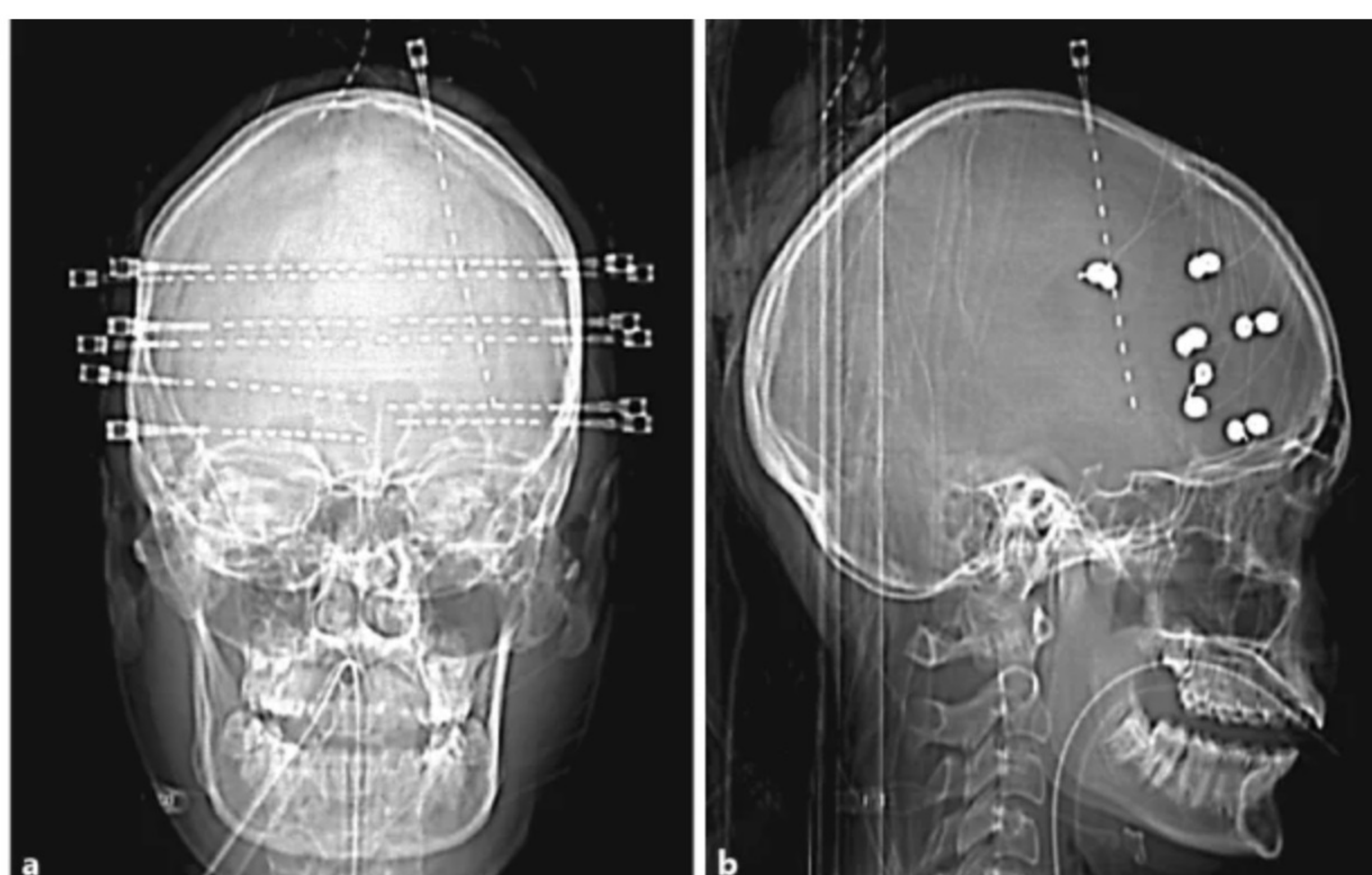
At one year post-procedure, 60-80 percent of patients are seizure-free. Among these patients are children with tuberous sclerosis complex who had multiple epileptic foci throughout their brains.

Laser ablations have also been used in children where it was difficult to identify the specific part of the brain where the seizures were occurring. Here, we feature a [case report published in Stereotactic and Functional Neurosurgery](#), in which the ROSA® robotic surgical assistant was used to facilitate stereotactic EEG (S-EEG) localization and therapeutic thermal laser ablation.

The patient was a 17-year old girl with intractable partial epilepsy. She was told that there was no surgical treatment, and the side of the brain where the seizures were occurring could not be determined despite having a very stereotyped seizure pattern.

[David Gonda, MD](#), director of epilepsy surgery at Rady Children's and assistant clinical professor of neurosurgery at UC San Diego School of Medicine, used the ROSA to insert electrodes into her frontal lobes. The S-EEG then localized the seizure focus to a region of the brain – the right cingulate gyrus – that could not have been localized in any way other than with depth electrodes. Robotic-assisted lesioning of the cingulate gyrus was performed via five total ablations with three minimally invasive catheters.

**Fig. 1.** Robotic-assisted S-EEG electrode placement. AP (a) and lateral (b) plain films obtained after placement of 13 S-EEG electrodes, seven on the left and six on the right. Head CT obtained at this time without signs of acute intracranial pathology (images not shown due to electrode-related artifact).

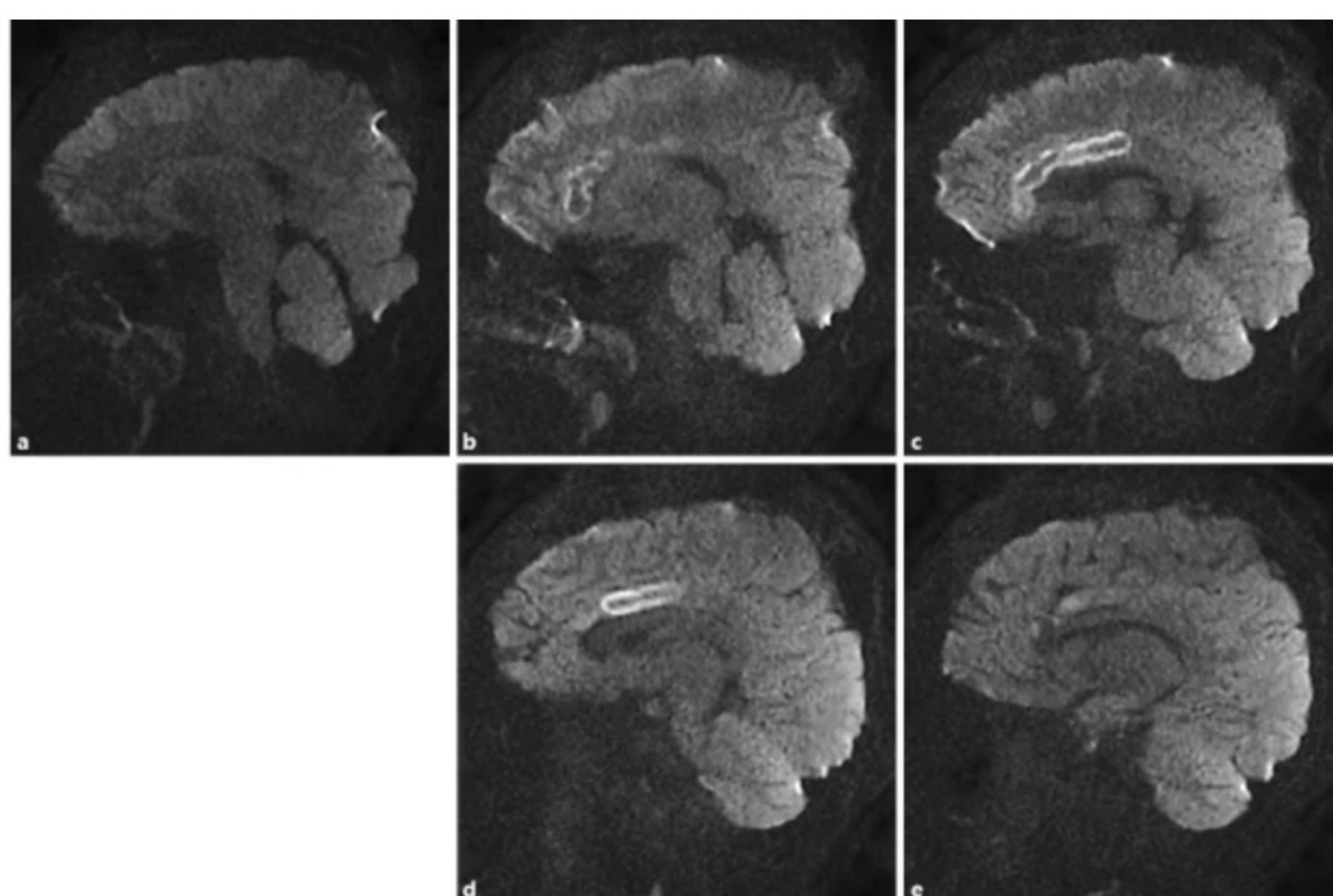


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There were no perioperative complications, and the patient was discharged home on postoperative day two at her neurologic baseline. She was seizure-free for eight months postoperatively, with a sustained partial response through the 23-month follow-up.

The advantages of robotic-assisted S-EEG placement and ablation in this case are perhaps best appreciated when compared to more traditional, open procedures. For nonlesional epilepsy, congruence across multiple modalities, including scalp EEG, PET and fMRI, is typically needed before standard invasive neuromonitoring is considered due to the surgical risk of the procedure. Then, if the epileptogenic zones (EZ) are localized to the cingulate gyrus, the morbidity related to open transcortical or interhemispheric approaches to this area is reported to be as high as 41 percent in epilepsy surgery and 89 percent in tumor surgery, with a nearly a 10 percent rate of permanent neurologic injury.

**Fig. 2.** Successful focal laser ablation of cingulate gyrus epileptogenic zone. Serial diffusion weighted sagittal MRI images (a-e) demonstrating focal ablation of the anterior portion of the right cingulate gyrus, without damage to surrounding structures



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The improved risk profile of the minimally invasive techniques used in this case enabled the safe surgical localization and ablation of at least a portion of the EZ in the patient, who without this technology would likely not have been considered a surgical candidate. Even though the patient experienced a delayed seizure recurrence postoperatively, the partial response with ablation confirmed the relative location of the EZ for a potential future resection of the ablated area with wider margins.

A future resection was indeed performed, with re-implanted electrodes localizing the ablated area. The patient is now seizure-free.

[Learn more about our epilepsy procedures.](#)