



A Guide to Stereoelectroencephalography

Hope for Patients with Severe Epileptic Seizures

Stereoelectroencephalography (SEEG) is an invasive surgical procedure that is used to identify areas of the brain where epileptic seizures originate. With SEEG, doctors place electrodes in targeted brain areas, which are then monitored to precisely locate seizure source. When the seizure onset is localized, a surgical resection and a good seizure outcome may be possible.

In March 2009, Cleveland Clinic launched the first SEEG program in North America. If you or a loved one has found no medical or surgical option for uncontrollable epileptic seizures, you may want to know more about this promising technique.

Who can benefit from SEEG?

SEEG may help you if you:

- have focal epilepsy and seizures (complex partial seizures) that do not respond to two medications or medical treatment.
- are a potential candidate for epilepsy surgery.
- have seizures of undetermined origin.

Who cannot benefit from SEEG?

If you have generalized epilepsy, SEEG surgery is not an option.

Is there an age limit?

The average age of SEEG patients at Cleveland Clinic is 25 to 30, but children as young as 2 can safely undergo the surgery.

What are the advantages of SEEG?

SEEG is a minimally invasive approach for epilepsy localization:

- to implant the electrodes, the surgeon makes 10 to 20 small incisions in the scalp, with no blood loss.
- while SEEG surgery lasts five to six hours and requires general anesthesia, removal of the electrodes is a simple procedure that takes 10 to 15 minutes under local anesthesia.

Why does it take so long to place the SEEG electrodes?

Electrode placement goes quickly, but it takes time to plan for that placement. Success in identifying seizure source depends on being extremely precise. In approximately 90 percent of SEEG cases, we are successful.

SEEG is a big leap forward in our ability to be precise. It's the difference between sitting in the back of the stadium, where you can barely see what the players are doing, and having a front-row view. SEEG puts us in the front row.

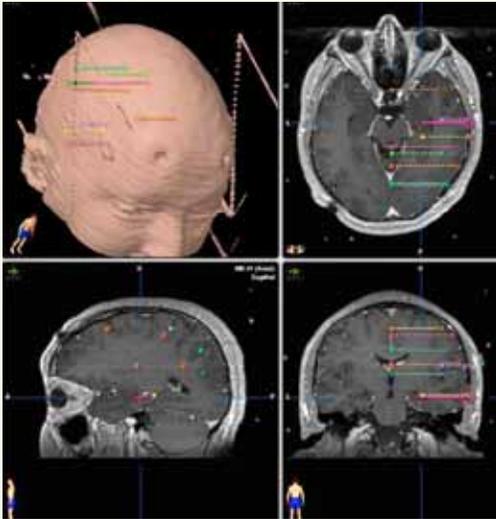
What other benefits does SEEG offer?

Through SEEG, we can reach areas of the brain that are off limits with subdural grids:

- Grids are placed directly on the surface of the brain and they are good for localizing surface seizures, but they are not effective for seizure sites deep in the brain. SEEG can go deep.
- SEEG can cover larger brain areas and, very importantly, it can be used to monitor both sides of the brain. Until now, when seizures were coming from both hemispheres, we could do nothing to localize them.

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Advanced imaging and post-processing technology enable us to accurately visualize the location of various depth electrodes in the brain.



How long must SEEG patients stay in the hospital?

After surgery, patients go to our Epilepsy Monitoring Unit, where they are observed for seizure activity. The Cleveland Clinic Epilepsy Center has dedicated adult and pediatric monitoring units, both staffed around the clock with teams of specialists and equipped with the latest technology.

The average stay is one week, but some patients may remain longer while we watch for seizure onset. The electrodes should be removed as soon as the information is captured to minimize the risk of infection.

What happens next?

Any subsequent epilepsy surgery depends on what is learned from the monitoring. SEEG is a tool that provides more accurate localizing information, which is shared with patients.

SEEG Step by Step

If doctors decide you are an appropriate candidate for SEEG to treat your focal epilepsy, here is what will happen immediately before, during and in the period after the procedure.

DAY BEFORE SURGERY

After you are admitted to the hospital:

- > You will meet with your doctor or a nurse, who will glue markers called fiducials to your head. Fiducials are reference points that show up on magnetic resonance imaging (MRI) to help guide the neurosurgeon in the operating room.
- > Then, you will undergo an MRI and laboratory work.

DAY OF SURGERY

You will meet with the anesthesiologist, who will administer general anesthesia. After you are asleep:

- > A stereotactic frame will be placed on your head.
- > A computed tomography (CT) exam will be performed.
- > A cerebral angiogram will be performed in the operating room. In this procedure, a catheter will be threaded through your groin and up into an artery in your neck. Then, a special contrast dye will be injected into the catheter. The dye will highlight the circulatory system of your brain.
- > Doctors will use all this information as they plan to place electrodes in the part of your brain where they think your seizures are originating.
- > Once doctors have placed the electrodes, the head frame will be removed. You will be awakened and transported to the recovery area.
- > A postoperative CT scan and skull X-ray will be performed in the recovery room.
- > You will spend the night in the recovery room or in one of our stepdown units.

DAY AFTER SURGERY

You will be transferred to the Epilepsy Monitoring Unit, where the electrodes will be connected to monitoring equipment that will begin to record your brain activity.

NEXT ONE TO FOUR WEEKS

The length of the monitoring phase varies, depending on the frequency of your seizures, but lasts no longer than a month. After recording has been completed:

- > The electrodes will be removed under local anesthesia and sedation, usually in the operating room. Typically, this simple procedure takes 10 to 15 minutes.
- > Your recorded data will be reviewed and epilepsy specialists will form a plan for surgical removal of the seizure site, if indicated.
- > You will be discharged the next day with instructions to return in eight weeks for the surgery, if recommended. This “holiday” period will allow for better results and fewer complications after surgery.