PENN EPILEPSY CENTER

Epilepsy Surgery at Penn Medicine
For more information about the Penn Epilepsy Center or to schedule an appointment, please call 215.662.3606. To coordinate surgery at the Penn Epilepsy Center, please call 215.349.5044.
Introduction

Deciding whether or not to have surgery to manage your epilepsy requires careful consideration. Many patients have questions and anxiety about what to expect. At the Penn Epilepsy Center, we are committed to helping you improve your quality of life by managing and minimizing your seizures. We have prepared this guide to help you determine whether or not surgery is right for you and to answer any questions or concerns you may have.

Is epilepsy surgery right for me?
Some patients may find that their seizures are not managed despite trying different medications. In these cases, epilepsy surgery may be an option.

Who can I talk to about epilepsy surgery?
You may ask your doctor whether this is an option for you, or your doctor might suggest it.

If I decide that I’d like to have epilepsy surgery, what are the next steps?
• Your doctor will want to be sure that surgery is your best option, so will begin by gathering more information on your medical history.
• To determine whether you qualify for surgery, your doctor will require you to have diagnostic testing to assess what is happening in your brain. The goal of these tests is to see what part of your brain is causing your seizures and if that part of your brain can be safely operated on.
Pre-surgical Diagnostic Testing (Phase I)

If you and your doctor have determined that you would like to pursue surgery to manage your epilepsy, the next steps will likely be pre-surgical diagnostic testing. Testing is done in two phases.

*Please be aware that not every patient requires any or all of these procedures*

**What is pre-surgical diagnostic testing?**
Pre-surgical diagnostic testing is a series of tests that will tell your doctor where your seizures come from and what kind of surgery is best for you.

**Do I have to get all of these tests done?**
Not always. Your doctor will recommend which tests, if any, are right for you.

**What happens after testing?**
After completing all of your testing, your Penn Epilepsy team will discuss the case and figure out the best options for treating your epilepsy.

**Diagnostics tests may include:**

**EPILEPSY MONITORING UNIT (EMU)**
The Epilepsy Monitoring Unit (EMU) at Penn is an eight-bed unit with video EEG where you will stay as a part of your diagnostic testing. This test is important for determining if a patient is a surgical candidate or not. During your stay, you may be weaned off your seizure medications so that the team can capture your seizures.

This average EMU hospital stay is 5–6 days but could be longer or shorter.

**How to Prepare:**
- DO NOT use any styling products in your hair before arrival because it could prevent the wires from sticking to your head.
- Bring books, handheld gaming devices, computers, tablets, or cell phones for entertainment.

To schedule your EMU admission, please contact Delight Roberts at 215.662.7294.
FUNCTIONAL MRI (FMRI)

A Functional MRI (or fMRI) is a radiology test that looks at the brain while you are resting or doing a task. An fMRI localizes the part of the brain that is involved in the task and its activity. The fMRI is done in the same MRI machine, but during the scan the radiologist looks to see how the blood flows in the brain by seeing the parts of the brain that are more “involved” or “active” during the task. These areas of the brain that are active, (increased blood flow) show up as bright colors on the images.

How to Prepare:

• Wear comfortable clothing.
• Remove any metal objects on your body or clothes.
• Continue taking your usual medications unless otherwise instructed.

The Penn Epilepsy Center will coordinate this for you.

MAGNETIC RESONANCE IMAGING (MRI)

A brain MRI (Magnetic Resonance Imaging) is a radiology test that creates an image or scan of the brain for your doctors to review. MRI images look at the structure (how the brain looks) and function (how it works) of the your brain. When considering epilepsy surgery, it is used for diagnostic purposes to assess if there is an obvious reason for seizures such as a scar or lesions on the brain.

How to Prepare:

• Wear comfortable clothing.
• Remove any metal objects on your body or clothes.
• Continue taking your usual medications unless otherwise instructed.

To schedule your appointment, please contact Penn Radiology at 215.662.3000.

MAGNETOENCEPHALOGRAPHY TEST (MEG)

Seizures cause unusual waves of electric activity in the brain. The source of these waves can be measured by a magnetoencephalography (MEG) test. The MEG helps create a picture of how your seizures spread through your brain.

An MEG scan takes about 1 to 2 hours. The Penn Epilepsy Center will coordinate this for you.

NEUROPSYCHOLOGICAL TESTING

Because epilepsy can cause problems with your memory, language and attention, neuropsychological testing is required to help the Penn Epilepsy team determine how epilepsy affects certain areas of your brain. Information from this test may help identify where your seizures are coming from.

Neuropsychological testing can take upwards of 5 hours. (continued on page 6)
How to Prepare:
- Bring your glasses and hearing aids if you wear them.
- Get a good night’s sleep and a good meal before the test.
- Wear comfortable clothing.

To schedule your appointment, please contact Karen Conroy at 215.662.3371.

**POSITRON EMISSION TOMOGRAPHY (PET)**

A positron emission tomography (PET) scan is used to monitor the areas of your brain that are using energy at higher or lower rates. During this test, the team is trying to locate those areas of your brain using less energy, which indicates that your brain is not working properly in those areas. Before going into the scanner, you will receive an injection of a tracer.

A PET takes about 30 minutes, but prepare to be there for 2 to 3 hours.

How to Prepare:
- DO NOT eat or drink anything besides plain water for 4-6 hours before test.
- Eat a low carbohydrate diet the day before the test.
- Refrain from exercise for 2 days before the test.
- Tell your doctor if you think you may be pregnant or if you are breastfeeding.

To schedule your appointment, please contact Penn Radiology at 215.662.3000.

**SINGLE PHOTON EMISSION COMPUTED TOMOGRAPHY (SPECT)**

A single photon emission computed tomography (SPECT) procedure shows areas of your brain that have higher or lower blood flow. More blood flow means that your brain is using more energy. For this test, you will have a small amount of tracer injected which will help trace your blood flow. A SPECT is only done during the EMU admission.

The SPECT scan itself takes about 30 minutes, but you may be at the imaging department for about 1.5 hours.

How to Prepare:
- DO NOT eat or drink anything other than plain water for 4 to 6 hours before your test.
- Please let your doctor know if you think you may be pregnant, or if you are currently breastfeeding your child.

The Penn Epilepsy Center will coordinate this for you.

**VISUAL FIELDS**

The visual field is the area that a person can see at any one time. The Visual Fields test help determine the borders of your visual field and how well you can see in different areas of the filed. During the test, you will be in the dark with your head positioned facing into a bowl. You will be instructed to stare straight ahead at a target and to press a buzzer each time that you see a light.

Visual Fields take approximately 10-30 minutes per eye. To schedule your appointment, please contact Penn Neurodiagnostics at 215.360.0277.
Invasive Diagnostic Testing (Phase II)

Invasive diagnostic testing is used to better localize where your seizures are coming from. Once the doctors determine the location and type of seizure, you can undergo corrective surgery. The Penn Epilepsy team will coordinate all of the phase II tests for you.

PHASE II MONITORING (INTRACRANIAL EEG MONITORING)

During Phase II monitoring, a Penn neurosurgeon places wires and/or electrodes within or on top of your brain under the skull. Electrodes may be placed after removal of part of the skull or through small incisions in the scalp (see SEEG below). Your team will determine the best electrode placement method for you and will discuss your options.

You will be admitted for a hospital stay during Phase II monitoring. The day after surgery, you will have more testing and will undergo video EEG monitoring similar to your EMU stay. After testing is complete, you will have the electrodes and wires taken out. You will be discharged from the hospital a few days after your electrodes are removed.

Phase II Monitoring, including the surgeries and recovery time, can take 1 to 2 weeks.

How to Prepare:
- Be aware that your surgery will last about 6 to 8 hours.
- Bring comfortable clothes that can be buttoned or zipped from the front.

STEREO ELECTROENCEPHALOGRAPHY (SEEG)

A stereo electroencephalography (SEEG) identifies where your seizures are coming from in your brain. This test allows the team to see the deep areas of brain. Your surgeon will make 10 to 20 small incisions in the scalp. You will be given general anesthesia for this procedure.

The surgery to implant electrodes may last up to 8 hours. Monitoring may take 1 to 2 weeks (rarely longer).

How to Prepare:
- Bring comfortable clothes that can be buttoned or zipped from the front.
- Bring your phone, books, handheld gaming devices, etc. to entertain yourself.
- Be aware that electronic equipment may interfere with the EEG recording, in which case you will not be able to use that device. Battery powered devices are least likely to interfere.

WADA TEST

The Wada test tells your doctor what side of your brain controls speech and language, which determines whether or not you are eligible for certain types of epilepsy surgery. For this test, you will receive an injection through a vessel at the top of your leg, which temporarily inactivates one side of your brain.

The Wada test takes about 1 hour to complete, including the injections.

How to Prepare:
- DO NOT eat or drink anything after midnight the night before your Wada test.
- Still take your medications.
Epilepsy Surgical Options

Once phase I and II testing is complete, you will discuss surgical options with your doctor and the Penn Epilepsy team.

Surgery can be performed:

• to remove the area of the brain that causes seizures
• to disrupt the nerve pathways that seizure impulses take through your brain, or
• to implant a device to treat your epilepsy and decrease the number of seizures you are having.

Prior to surgery, most patients will have a Stealth MRI. Patients who are undergoing a VNS placement will not be required to have a Stealth MRI.

Surgical options for epilepsy vary, and not every patient requires any or all of the surgical procedures listed below.

VAGAL NERVE STIMULATION (VNS)
The Vagal Nerve Stimulation (VNS) is a minimally invasive and outpatient procedure that may help reduce seizure frequency and may improve mood and seizure control. The VNS gets implanted into your brain.

NEUROSTIMULATION (RNS)
Neurostimulation (RNS) is for patients with seizures occurring in multiple places in the brain or for patients who cannot have a brain resection because the brain where seizures are starting from cannot be safely removed.

The RNS device gets implanted into your brain and detects when a seizure is about to occur, then stimulates your brain to stop the seizure from spreading.

LASER ABLATION
Laser Ablation is available to patients with seizures localized to one place in the brain, most commonly in the temporal lobe. Laser Ablation uses a laser beam to cauterize the diseased part of your brain that is causing your seizures.

RESECTION
A resection is the removal of the part of your brain that is causing seizures. This procedure requires an inpatient stay at the hospital.
Post-Surgery

Following epilepsy surgery, the Penn Epilepsy team will help guide you through next steps, which typically include treatments and further testing.

**Will I need any other treatments after surgery?**

Yes. It is important to take your medications and attend your follow-up appointments, which helps to reduce your seizure frequency. Doses of seizure medications are not typically lowered until your brain has healed after a surgery, which usually takes at least a year.

**Will I need any more testing after surgery?**

Further testing may be required to determine how well your surgery worked.

**Are there any support groups or resources available for my family and me after surgery?**

Yes! There is information on PennMedicine.org/epilepsysupport about when and where the Penn Epilepsy Support Group meets. Penn also has an epilepsy email newsletter that provides resources and the latest news for epilepsy patients. To sign up, please visit PennMedicine.org/Epilepsy.

Sign up for myPennMedicine to communicate with your care and view test results. Go to www.myPennMedicine.org.
Penn Epilepsy Center Team

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