

Some people with epilepsy can't obtain seizure control despite trying a number of antiepileptic medications. There are other treatment options available to manage epilepsy and control seizures. One of these is surgery.

Why epilepsy surgery?

Epilepsy surgery offers you a chance to be seizure-free or at least to have fewer seizures. Surgery may also allow your antiepileptic medications to be reduced - although ongoing antiepileptic medication is sometimes necessary long-term.



Two groups can be considered for surgical treatment of epilepsy.

1. People with focal epilepsy, predominantly temporal lobe epilepsy, but other areas of the brain are not excluded.
2. People with generalised epilepsy who have debilitating tonic or atonic seizures, otherwise known as "drop attacks".

Surgery may be considered when:

- Seizures are found to be resistant to medication or "intractable" and the person has trialled 2 or more appropriate medications and failed
- Seizures originate from only one small area of the brain (focal seizures, even if they evolve to become a bilateral convulsive seizure)
- Seizures are particularly debilitating or dangerous such as tonic, atonic seizures (drop attacks) and status epilepticus (very long seizures)
- Seizures are occurring many times a day, making normal life impossible
- The cause of seizures requires surgery, e.g. a tumour or abnormal brain tissue

Pre-surgical evaluation

Candidates for epilepsy surgery undergo an extensive pre-surgery evaluation. The tests help to pinpoint the area in the brain where the seizures begin, called the seizure focus, and to determine whether surgery is possible. The evaluation also helps to precisely identify important structures and functions in the brain so that the seizure focus may be removed without causing damage or impairment.

The pre-surgical evaluation includes an extensive medical history and seizure history. A complete physical examination is also performed. Then a series of tests are performed, usually before hospital admission, and in hospital telemetric video EEG is done to record seizures - for approximately one week.

The tests in the pre-surgical workup include:

Video/Telemetric EEG (electroencephalogram)

This is a continuous recording of your brain waves (EEG) and video monitoring for a period of several days. The aim is to record a number of seizures on EEG and at the same time record what you physically do during seizures. This helps to identify the area of your brain where the seizures are starting.

Small electrodes (approximately 20) are glued to the scalp, gel is squirted inside the electrodes and they may be secured with a bandage. The bandage, not the electrodes, will be removed every day to re-gel the electrodes. To reduce the time needed in hospital, your medication doses are lowered to help provoke seizures. You may be kept awake longer than normal, because sleep deprivation can often trigger seizures.

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Being monitored can be a difficult and frustrating time as it can often take days for a seizure to occur. Ideally 3-5 seizures should be recorded. You will also need someone (family or friend) to be with you 24/7 during this time for safety reasons.

You will be placed on a waiting list for inpatient video EEG and there can be a waiting list of several months, depending on the centre.

Tips:

- Changing clothes is easier by wearing tops that button or zip up at the front or back.
- Bring into hospital items that do not need to be attached to a power source such as books, journals, games and puzzles. You may use a computer but the battery will need to be charged away from the monitoring equipment.
- Watching television or videos and having lots of visitors can also help.
- Smoking is not permitted inside the hospital and you will not be able to leave the monitoring room. If you smoke, consider giving it up before admission or purchase nicotine patches.
- Chewing gum will not be allowed as it interferes with the EEG.

MRI – Magnetic Resonance Imaging

MRI uses a magnetic field and radio waves to record detailed pictures of the brain, which is effective in identifying some brain abnormalities seen with epilepsy. The scanner is like a tunnel and makes loud thumping noises. Most MRI scanners are equipped with mirrors, microphones and music so you will be able to relax or communicate with the technician. The MRI may last from 30-60 minutes and uses no radiation.

Tip: It is important to notify the technician prior to the test if you are stressed by confined spaces as a short acting relaxant can be given.



fMRI – Functional Magnetic Resonance Imaging

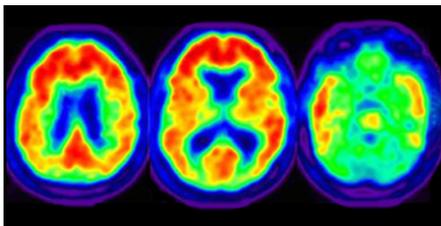
This is a technique for measuring brain activity by detecting the changes in blood oxygenation and flow that occur in response to brain activity – when a region of the brain is more active it uses more oxygen and to meet this increased demand blood flow increases to that area.

PET – Positron Emission Tomography

PET looks at the functioning of the brain, measuring (glucose) metabolic activity, so you will be asked to fast beforehand. It will produce a 3 dimensional image of the brain. With epilepsy, the region of the brain where the seizures originate often has decreased metabolism or activity – unless a seizure occurs during the uptake of the substance, which will increase the metabolism in this area. For this reason, EEG is also recorded during the PET scan.

Once again, a radioactive substance is injected into the bloodstream and carried to the brain. Earplugs and eye patches are applied to reduce external stimulation (because the scan examines how the brain is functioning, so stimulation can alter results). Just prior to the scan, a mask is moulded to your face.

The scan itself takes approximately 30-45 minutes and it is important that you remain quiet but awake during this scan. On most occasions a video/telemetric EEG will be performed 30 minutes prior to the scan and also simultaneously with the PET scan, so the whole procedure can take over 2 hours.



Women of reproductive age will be routinely tested for pregnancy prior to this test. It will not be performed if the woman is pregnant.

SPECT – Single Photon Emission Computerised Tomography

If more information is needed about where your seizures are coming from this scan is performed. A SPECT scan examines blood flow within the brain.

A radioactive substance is injected into the bloodstream and carried to the brain. Usually two of these scans are done if surgery is being considered:

- one when you are not having a seizure
- and the other immediately after a seizure. The injection is actually given during the seizure and the scan can be done within four hours of the injection.

When there is no seizure activity, the blood flow should be reduced in the area of the seizure focus. During a seizure the blood flow should increase in this area. The scan takes about 30 minutes.

Once these scan are all completed they will be viewed by your Neurologist and compared for consistency.

Neuropsychological Evaluation

This evaluation helps to determine which regions of the brain may be related to or affected by the seizures. It gives an indication of which parts of the brain, if any, are not functioning well. The neuropsychologist will test your mental functions such as memory, problem-solving, attention, learning, language, behaviour and personality. There are no invasive procedures, no pain, no needles, or electrodes. The neuropsychologist may also ask you about your family and medical history. Testing may take 6-8 hours to complete, often in blocks of 2-3 hours when you are functioning well and there is no pass or fail.

Tip: This testing should be done when you are feeling well and alert, so let the neuropsychologist know if you are feeling overtired or may have a seizure. It is important the neuropsychologist knows when your last seizure occurred or if you feel like you may have a seizure on the day as it can affect results.

Psychiatry

The surgical program is not an easy process and can be a stressful time for most people. A routine visit to a psychiatrist is part of the pre-surgical work-up. The psychiatrist will assess how you are coping with living with epilepsy and seizures and how well you may cope with surgery.

WADA Test

This test is usually not necessary and is only done if the neuropsychological evaluation tests were not able to determine which half of the brain is dominant for speech and memory. It also helps to assess how well the temporal lobes will support good memory function after surgery.

The test involves an anaesthetic which is injected into a large artery to put half of the brain to sleep. During this brief anaesthesia, the neuropsychologist will ask you to identify objects and remember a number of pictures and words. About 15 minutes later, you are then asked to recall these pictures and words. Because half of the brain is anaesthetised for this short time about 5 minutes, half of the body will be paralysed, vision in one eye is lost and you may have speech difficulties. Some people can find this distressing, but it is only lasts for the duration of the anaesthetic.

This test also requires an angiogram, which will be explained to you by the doctor.

Because the WADA test is more complex than explained here, and an angiogram carries a risk of complications, a thorough explanation and consent is necessary.

Invasive monitoring

Sometimes even video EEG results may be inconclusive and further monitoring may be necessary. In this situation electrodes have to be implanted directly into or on the surface of your brain.

These are not commonly used but may be needed when other tests have not determined the exact location of the seizure focus. This is a major surgical procedure. After the electrodes are implanted, there will be another period of video-EEG monitoring to record seizures. The type of electrodes and surgery varies and will be fully explained to you prior to the test and you will be asked to complete a consent form.

Surgery - who decides and when?

Usually there is a meeting of all the professionals involved in your pre-surgical work-up where all the test results are discussed and compared. Surgery will not be performed unless all the professionals involved are confident that you will obtain significant benefit.

The decision to operate is only made after all the tests are done and is based on the results of tests, a joint decision by the team, and you wanting to proceed with surgery. Your chances of successful surgery and risks for complications will be explained to you by the surgeon.

**At any stage during the pre-surgical work-up you can decide that you do not want to have surgery.
Also be prepared that surgery may not be an option for you.**

The surgery

The goal of epilepsy surgery is to improve a person's quality of life by stopping or reducing the frequency of seizures, without causing neurological impairment.

Preparing for surgery

When you are about to have surgery it is important to:

- Stay healthy
- Talk to your family and friends about the surgery
- Take your medications as prescribed by your doctor
- Stop smoking
- Stay well informed through the surgical process by being in touch with the hospital professionals
- Ask for assistance from them if you have any questions about the surgery and post surgery time
- Speak to someone who has had the surgery if possible.
- Ask lots of questions

The operation

The surgery will be performed by a neurosurgeon and takes a few hours but it will take longer for you to fully recover. Most people spend a night in intensive care and then about five days in a ward. The surgical incision is usually closed with skin staples, which are removed in about 5-10 days. Removing the skin staples can be uncomfortable but is generally not painful. The area around the incision site and sometimes the eyes can be puffy and numb for several days.

As with most surgery there are risks like infection and haemorrhage [bleeding]. Common symptoms straight after surgery are numbness around the incision site, dizziness, unsteadiness, nausea, vomiting, headache, jaw ache, swelling, bruising, blurred vision and short-term depression.

After surgery

Discharge from the hospital following surgery is usually after about seven days. Before discharge, the neurologist and neurosurgeon will arrange follow-up appointments for you, which will usually occur about four weeks after surgery.

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The scar from the surgery should be kept clean and dry and it is important to let the surgeon know if it is red, swollen or painful. Hair washing is okay, but it is not advisable to use hair dyes for a few weeks after surgery.

It is important to rest following surgery, gradually increasing activity over the next couple of weeks. A daytime rest may be reasonable but ensure that this does not affect your night sleep. Increase exercise gradually but avoid exhaustion and overdoing it. All contact sports should be avoided for 12 months while the skull bone is healing.

Some time off work to recover will be necessary. How long will depend on how you are feeling and the type of job you have. It is best to discuss this with your surgeon or neurologist.

The neurologist may change your medications on discharge from hospital or at follow-up appointments. Follow-up appointments with the Neurologist and the Neurosurgeon will be arranged for approximately every three months for about a year.

You may also be asked to see the Neuropsychologist to retest and assess any possible changes. You may find that your memory seems better and that you feel more alert.

Some people experience some depression following surgery but this is temporary and should resolve within 3-6 months. If you feel you are experiencing any depression you should notify your Neurologist immediately.

Life after surgery

Up to 70% of people become seizure free after surgery. Not having seizures can create significant changes to life, such as relationship dynamics, employment options and choices. Often this is a time to make major life-changing decisions. Although a lot of these adjustments are positive, some people encounter difficulties adapting or find the experience overwhelming. Do not be afraid to seek help if you feel you are not coping, as this can be a normal response.

Not all people who have epilepsy surgery are seizure-free following surgery, but there is usually a significant decrease in seizures. Some people may have some seizures immediately after surgery but this does not mean that the surgery has not been successful. The driving licensing authority enforces no driving for 12 months after surgery.

Speak to the neurologist before drinking alcohol or taking other medications or drugs.

For more comprehensive details about the above procedures, speak to your doctor.

Often the hospital providing the service will have their own information handouts.

REFERENCES

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This information is given to provide accurate, general information about epilepsy. Medical information and knowledge changes rapidly and you should consult your doctor for more detailed information. This is not medical advice and you should not make any medication or treatment changes without consulting your doctor.

