EPILEPSY NEW ZEALAND
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# Tests and Investigation



People sometimes think that imaging tests such as an EEG, CT scan or an MRI will determine that they have had a seizure. However, information from tests alone can't always confirm that a seizure has occurred, or that the person has epilepsy.

An EEG examines electrical activity in the brain. However, electrical changes are often only seen during a seizure. This means that when an EEG comes back normal, it could simply indicate that seizure activity was not occurring when the test was taken – it doesn't mean that a seizure has not occurred at another time. An abnormal EEG can suggest that a person is more likely to have seizures which can be helpful to the doctor during the diagnosis period. However, an EEG can be abnormal for a variety of reasons unrelated to seizures.

MRI and CT scans show how a person's brain is structured and, sometimes, a possible cause for seizure activity can be seen on a scan. This may be small changes in how the brain tissue developed, blood vessel changes, or changes as a result of a tumour or traumatic brain injury. But, just like an EEG, the scans can show up as being normal in people who have had a witnessed or suspected seizure. It is also possible for a person to have an 'abnormal' CT or MRI and not have a diagnosis of epilepsy.

Additional tests such as SPECT (single-photon emission computed tomography) and PET (positron emission tomography) scans may also be recommended. A PET scan provides information about how an organ or system in the body is working, and a SPECT scan shows how blood flows to tissues and organs – both scan can assist helping to identify seizure onset zones in the brain. However, not everyone will need to undergo these tests, and sometimes they are only used as part of pre-surgical evaluation.

Often, people who are being assessed for epilepsy undergo a number of diagnostic tests. We have listed some of the most common tests below, but not all people will need to have all of these tests.


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## BLOOD TESTS

Blood tests are usually ordered as this can check the overall health of a person.

Sometimes blood tests are ordered *after* a person has been diagnosed with epilepsy and they are receiving treatment. This may be for the doctor to keep an eye on the person's general health, as well as their medication levels.

## ELECTROENCEPHALOGRAM (EEG)

An EEG records electrical signals from the brain. Small discs, called electrodes, are placed on a person's scalp using glue (which can be washed out!). The electrodes pick up the "brain waves" and the electrical activity is recorded by the EEG machine. The electrodes pick up electrical activity, but don't give out electricity. It is a simple and painless test that does not involve needles and does not give electrical shocks. An EEG usually takes about an hour. For the best results, a person's hair must be clean and dry, with no products (hairspray, gel or oil).

During an EEG, patients are often asked to open and close their eyes, breathe deeply and look at flashing lights. Sometimes the doctor will request a 'sleep-deprived' EEG. This means the person will be asked to have fewer hours sleep the night before the test. A sleep deprived EEG is often ordered by the doctor if the person's routine EEG was reported as normal. A person who is sleep deprived is more likely to have abnormal electrical activity recorded during the EEG that can help determine if the person has developed epilepsy.

## EEG/VIDEO MONITORING

Sometimes it is useful to perform an EEG over an extended period of time while a person is being monitored by a video camera. If an event is recorded, this allows the doctors to match the electrical activity recorded by the EEG with what the seizure looks like in real life.

## AMBULATORY EEG (AEEG)

Ambulatory electroencephalography (AEEG) monitoring is a new technology that allows prolonged electroencephalographic (EEG) recording. It is generally prescribed by a neurologist. However, it may be prescribed by other health professionals in certain circumstances. The test can last for up to several days, and may take place in the person's home or a medical setting.

## COMPUTED TOMOGRAPHY (CT) SCAN

This test looks for abnormalities or damage to the brain. During a CT scan the patient lies on a table which allows their head to be scanned by the CT scanner. Sometimes a special dye is injected into the arm to enhance image quality. CT scans are not suitable for women who are pregnant, as the x-rays could affect an unborn baby.


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## MAGNETIC RESONANCE IMAGING (MRI) SCAN

A MRI scan usually provides more detailed images of the brain than a CT scan.

Before a MRI, the person is required to remove any metal objects such as jewellery, hearing aids, or hair clips. People who have a pacemaker or any other surgical implant containing metal may not be able to have an MRI scan, although some newer MRI machines can now be safely used by those with implanted devices – just speak to your doctor if you have any concerns about this.

During a MRI scan, a person lies very still on a table inside a tunnel-shaped scanner. A handheld remote is given to hold, so the person can let the technician know if they are feeling uncomfortable or unwell during the scan. The technician will speak to the person and check they are OK. The scanner makes loud noises, so before it starts people are also given earplugs to wear or headphones to listen to music.

## FUNCTIONAL MAGNETIC RESONANCE IMAGING (FMRI) SCAN

A fMRI is used to find out which parts of the person's brain are affected by seizures, and what happens to their brain when a seizure occurs.

This scan looks at how the brain is working, by looking at changes in blood flow while a person is performing different tasks. This may include reading specific words or passages, or looking at different objects and naming them.

When people are being considered for surgery, a fMRI is often used to help doctors understand the possible effects of operating on parts of the brain. You can read more about epilepsy surgery and assessment here.

## ELECTROCARDIOGRAM (ECG)

An ECG is used to record the heart's electrical activity. Small metal tabs (called electrodes) are fixed to the skin on the arms, legs and chest with sticky paper. These electrodes pick up the electrical signals from the heart. Having an ECG does not hurt. An ECG will help to find out if the person has a heart condition, or is experiencing fainting (which can look like a seizure).

## SINGLE-PHOTON EMISSION COMPUTED TOMOGRAPHY (SPECT) SCAN

A SPECT scan measures blood flow in the brain. A safe, short-lived radioactive substance is injected into the arm of a person while they are having a seizure. A SPECT scan is only conducted during admission to an Epilepsy Monitoring Unit in a hospital, and is performed by specially trained healthcare staff (such as nurses).

SPECT scans can assist doctors to better understand which region/s in the brain a seizure is coming from. Not all people who have epilepsy will necessarily need a SPECT scan, and it is often used as part of clinical neurosurgical evaluation. You can read more about epilepsy surgery and assessment

here.

SPECT scans are not suitable for women who are pregnant as the radioactive substance can affect an unborn baby.

## POSITRON EMISSION TOMOGRAPHY (PET) SCAN

A PET scan test shows the energy usage of a person's brain. Like a SPECT scan, the person is injected with a safe, short-lived radioactive substance into the bloodstream. Once it has been absorbed, a scan is performed soon afterwards.

Sometimes the test can take a couple of hours, so it is a good idea to wear comfortable clothing. The person usually needs to go without food and drink (fast) before the PET scan is performed.

PET scans can assist doctors to better understand which region/s in the brain a seizure is coming from. Not all people who have epilepsy will necessarily need a PET scan, and it is often used as part of pre-surgical evaluation. You can read more about epilepsy surgery and assessment here.

PET scans are not suitable for women who are pregnant as the radioactive substance can affect an unborn baby.


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