

Mersey Region  
Epilepsy Association

# Surgical Treatment



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## Epilepsy and Neurosurgery

### A basic guide for prospective neurosurgical patients

#### Foreword

**Professor Paul Eldridge**

Consultant Neurosurgeon at the Walton Centre for Neurology and Neurosurgery, Liverpool

Despite the progress with modern medicine and continuing development of new drugs, it remains the case that a substantial number of people have epilepsy which cannot be treated by antiepileptic medication alone. Those unfortunate enough to suffer from epilepsy in this way, and their friends, relatives and carers, won't need to be told of the major impact this has on their lives.

For a proportion of such patients, a further option does exist, namely neurosurgical treatment for their epilepsy. In suitable cases, this can be highly effective and can eradicate epilepsy from an individual.

As the reader will discover from this book, many procedures involve major operations removing those parts of the brain causing epilepsy. It will come as no surprise to learn that evaluation of patients for surgery is a demanding process and that subsequent surgery, whilst offering the chance of alleviation of the epilepsy, also carries with it serious risks to life and to limb, although happily such negative outcomes are rare.

From a neurosurgical perspective, there are many technical considerations involved in epilepsy surgery. These cover such topics as interpretation of scans, neuropsychological testing, memory testing and recording of seizures in the evaluation of deciding whether a patient is suitable for surgery, and subsequently the technical aspects of the surgery itself.

Whilst dealing with these issues, one of the major tasks facing the team (of whom only one is the neurosurgeon) is the need to provide information to the patient, and of course whichever supporting relatives, carers and friends the patient consents to be informed, so that not only can the patient make an informed decision but also that appropriate support can be provided by these other individuals.

This is of major importance because, although the surgery for epilepsy can be successful, there are risks involved and the process is a long and demanding one including the post-operative period.

Whilst no information booklet can be wholly comprehensive as each patient is individual, we hope it will be of benefit to all those concerned.





## Introduction

This information is for anyone interested in finding out more about epilepsy surgery. Although written for you, the potential patient, its contents will be of interest to all including family, friends, and health workers. It offers a step-by-step guide to what you can expect, from being considered for surgery in the first place, to coping with life afterwards.

Surgery is carried out with the aim of reducing the number of, or getting rid of altogether, seizures which can't be satisfactorily controlled, either completely or partially, by antiepileptic medication.

The road to surgery is one of stringent and thorough procedures, including investigations, which may include hospital stays. However, since the first surgery for epilepsy was carried out in the late 19th century, surgical techniques have been ever progressing, with new advances meaning fewer risks to patients, and improved outcomes.

Surgery carries risks - and any patient must be fully committed, know the risks, and the chances of success and failure – but the quality of treatment is very high, and you will have an entire multidisciplinary team working on your behalf.

Before you even begin to consider surgery, and the major operation it entails, the medical team will be looking closely at a number of factors which would make you a candidate.

## Who can be considered?

The majority of people with epilepsy have their seizures well controlled by medication. If you find that despite trying medication, your seizures refuse to be controlled, surgery could be an option, or at least, you could fall into the group of people for whom surgery is an option.

To be considered for surgery, three criteria need to be satisfied.

- **Your epilepsy cannot be satisfactorily controlled by medication.**  
This means either your seizures haven't stopped, despite taking medication, or the side effects of the medication are unacceptable.
- **The seizures come from one area within your brain and that source can be identified.**  
For example, epilepsy can be caused by scar tissue or a lesion in the brain - if so, you satisfy at least one of the conditions for surgery: an identifiable focus within the brain. However, where epilepsy has followed a more generalised problem, such as encephalitis or meningitis, it is less likely a focus can be identified.
- **That the area of the brain causing the epilepsy can be removed safely.**  
If a focus can be found, the surgeon will look at how easy it is to get to this part of the brain and remove it safely. They will check that areas in your brain responsible for speech, sight and movement aren't too near the piece to be removed.

Then there are a number of other factors to be taken into consideration:

- **What sort of epilepsy do you have?**  
Epilepsy can be either partial, meaning seizures start in part of your brain, or generalised, meaning they affect your whole brain. If you have partial seizures originating in your temporal lobe, your epilepsy is more likely to respond to surgery because the place it comes from can be more easily located and removed. Indeed, the majority of surgery is carried out on the temporal lobe. Secondarily generalised seizures - which means the epilepsy starts in one part of the brain and spreads - is also treatable, again because there is a definite place from which the epilepsy starts.
- **How long have you had epilepsy?**  
Seizures can stop spontaneously, or be controlled by medication, so immediate surgery is not offered. If seizure control has not been achieved after two years, surgery can be considered. However, because success of the operation isn't just measured in terms of seizure reduction, but in quality of life (the effect of your seizures on work, education, relationships and so on) - if surgery is delayed too long, the 'damage' in those aspects may have already occurred.

Generally, if seizure control has not been established after two years, surgery can be considered as the next step in treatment.

If you've had seizures for a long time, you may be less suitable for surgery because the risks increase with age. The preferred time for surgery is in the younger years, because usually, the earlier it is carried out, the better the outcome. Surgery may therefore be considered in children as doctors recognise the potential impact of epilepsy on schooling and social development. Conditions found in children may include developmental disorders, for which you'll need specialist paediatric advice (and which we don't aim to cover in this booklet).

Unless the team can be sure there is a good chance of success and safety, surgery will not be recommended. That's why, before you even get to the operating table, you have to go through pre-surgical evaluation which involves a series of investigations to determine if you are suitable, and the chances of surgery working for you.

## Types of surgery

Most commonly, the aim of epilepsy surgery is to remove the part of the brain from where the seizures originate.

- **Temporal lobe surgery:** Operations carried out on the temporal lobe (and you may hear the term ‘temporal lobectomy’ to describe this). This is because scarring – known as ‘mesial temporal sclerosis’ or ‘hippocampal sclerosis’ – on the inside of the temporal lobe is a common cause of epilepsy that can be treated surgically. Indeed, many of the investigations before surgery are designed to detect the presence of such scarring.

Operations on the temporal lobe will reduce seizures in up to 80% of patients. In the long-term, seizure outcome can also be predicted quite reliably – and if you are seizure free a year after surgery, there is only around a 10% chance of your seizures returning over a five-year period.

Although generally the most successful type of surgery, there can be complications, and there is a mortality rate (risk of dying) of around 0.5%. Risks of side effects vary, but are between 2% and 4%. These side effects may include visual problems, memory problems and paralysis (stroke).

Any psychological problems following surgery are usually temporary but can include a period of depression. This is because the surgery ‘interferes’ with the temporal lobe, which is one part of the brain important for emotions. In all likelihood, any side effects you experience following surgery are likely to be temporary.

Generally speaking, temporal lobe surgery is thought to be safe and side effects only occur in a small minority of people.

- **Lesionectomy:** Sometimes a benign tumour may present with epilepsy as its only symptom. If slow growing, these tumours may not need treatment in their own right. However, their removal can cure the epilepsy in 70%-80% of cases. Other non-tumourous lesions exist which, again, may cause epilepsy, and may be treatable by removing the lesion. Individual cases vary and will be discussed in detail with each patient.

Frontal lobectomy: these operations, carried out on the frontal lobe of the brain, tend to be less successful (apart from those carried out to remove a tumour or cyst from this area – Lesionectomy). There is up to 40% chance of being completely seizure free after the operation, but the possibility of undergoing a frontal lobectomy needs substantial discussion with the medical team.

- **Hemispherectomy:** This is the name of a surgical procedure which removes or disables an entire cerebral hemisphere (one of the two divisions of the brain). This is carried out only if a whole side of the brain is damaged, and is most commonly performed on children who have severe or progressive neurological disease. This operation tends to be a specialised paediatric procedure and is only rarely performed.
- **Vagus Nerve stimulation:** Could be an option if you are not suitable for these types of surgery, or have had surgery without positive results. By stimulating the vagus nerve, it is believed abnormal brain activity could be intercepted. The procedure involves fitting a small generator, usually to the upper chest. Complete abolition of seizures is rare and not all believe the benefit of treatment is good enough to justify it. Improvement in seizure control of at least 50% has been reported in around half of the people and, overall, about a third of patients may benefit. Patients considered are usually those with extremely frequent seizures.

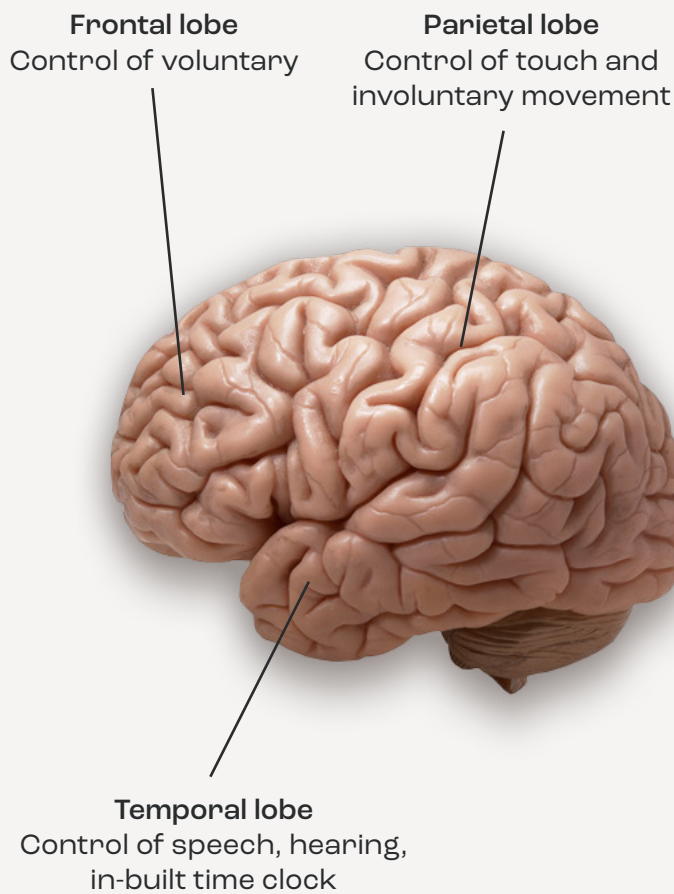
A number of other procedures exist, including Corpus Callosotomy and Multiple Sub-pial Transection, which are used in highly specialised circumstances. These are beyond the scope of this booklet.

New advances in epilepsy surgery are always occurring, and one area being evaluated is stereotactic radiotherapy, or radiosurgery. There are various techniques employed, one of which is 'Gamma Knife' surgery. As yet, there is no consensus as to the usefulness of these techniques.

The success rate has to be balanced against the time they take to work and the late onset side effects.

You will need to discuss potential risks with your doctor as part of your decision-making process if you are accepted for surgery. This is a most important statement and is repeated again in the section "Decision Time".

**A lateral view of the left hemisphere of the brain**



**Hemispheres seen from above**



## Investigations before surgery

The road to surgery is a long and thorough one. The following are the pre-surgical tests and procedures you can expect to come across on your journey and they, in themselves, can take several months to complete. The investigations you have will depend on the type of operation you are being considered for and how easy it is to locate the origin of your epilepsy. Some, such as affirming diagnosis, are usually straightforward. Others are more complicated and may involve a hospital stay, particularly if the origin of your epilepsy isn't easy to find.

- Confirming diagnosis and the type of epilepsy you have: your medical history will be recorded, and the symptoms of your epilepsy investigated, so it can be confirmed that the diagnosis is correct, and which type of epilepsy you have.
- Looking for scar tissues/lesions on the brain: an MRI scan uses a powerful magnet to produce images of the brain. This is called 'neuroimaging' and the aim is to look for possible scar tissue/lesions, which could be removed. This involves your brain (and you too!) being placed in a rather noisy and, for some people, claustrophobic, machine. For this procedure - which is both painless and safe - you can usually go as an outpatient.
- Neuropsychometry consists of a standard series of tests on intellect and memory: these tests might consist of a number of word, memory and drawing/constructing tests which give clues to how different parts of your brain function. These tests are carried out to assess general intellectual ability and memory so the risk of memory loss can be gauged, and to try and identify which side of the brain is responsible for language and memory.
- EEG video monitoring is a widely used evaluation. Many of you will have had an EEG, where electrodes are placed on your scalp and connected to a machine which reads your brain electrical patterns. In pre-surgical investigations, you may have an EEG with a difference. At the same time as having the electrodes in place, you'll be videoed. The recording provides confirmation that you do have epilepsy and information as to where in the brain your seizures are originating.

For this investigation, you will have to stay in hospital as an inpatient, probably for around a week. The aim is to evaluate the electrical activity in your brain due to seizures, and you may be taken off medication, or have the dose reduced.

It may be you need more specific electrodes than those offered by EEG. If so, you may have 'depth' electrodes inserted into your brain. This is done under general anaesthetic. Because these electrodes are in or on the surface of the brain, they give a more precise location of the epileptic focus. Once they are in place, a continuous EEG/video recording will be made. Do not expect immediate results, as extensive computer analysis is required.

- Testing the potential effects of surgery on your brain: the test which traditionally does this is called the Wada (sodium amytal) test. However, this test is rarely used today, especially in children. If used, the test, which gives an understanding of the effects that surgery may have on your speech, understanding and memory, puts one side of your brain to sleep. A fine tube will be inserted in an artery of your groin and threaded up the main blood vessel of your body into your brain. This will be done through the guidance of an x-ray and allows the doctors/surgeons to assess whether the remainder of the brain can cope if part of it is removed.
- Psychiatric assessments may be carried out to see whether there are of risks of psychiatric problems occurring after surgery. These assessments also act as a point of comparison - if psychiatric complications arise afterwards, were these problems there before, or are they a result of the surgery? It's generally considered that if you are found to have any psychiatric features such as personality disorder or severe depression before surgery, this may make you unsuitable, unless the episodes were confined to the period after seizures (post-ictal) and therefore belonged with your epilepsy.

The neurologist and the patient enter into full discussion about the benefits and risks of undergoing epilepsy surgery.

The neurosurgeon studies the results of the MRI scan as part of the decision-making process.

## Decision time

The epilepsy surgery team, which comprises the neurologist, neuropsychologist, neurosurgeon, amongst others, will have discussed your case, including what the outlook would be for you with or without surgical treatment. Are the risks that you would undergo in surgery be far greater than the benefit to be obtained? If the potential benefit is felt to outweigh the risks, then you could be offered surgery. You will need to discuss potential risks with your doctor as part of your decision-making process if you are accepted for surgery.

You may be told at this stage that surgery isn't possible for you. The risks you would be under would be far greater than any possible benefits. This may be a very disappointing time. You may be offered surgery. Now it's your decision, and it can't be overemphasised that, once surgery is offered, the decision to go ahead is yours and yours alone. Talk it over with as many people as you like. Ask as many questions of the medical team as you like. Only you can make the decision.

If you decide to accept the offer of surgery, you may then be placed on a waiting list.

## What happens when you go into hospital?

You've made your decision and got to the front of the queue. It's important you plan your hospital stay and your recovery time afterwards carefully. You will need to allow for 6-8 weeks to be at home, and if you work you will need to arrange the time off. If you feel unwell in the week or so before the operation, let your neurosurgeon know. This may mean postponing your operation but you will not lose time on the waiting list as a result. It is understood that you may wish to make arrangements for your home circumstances, for example, childcare and so on. If you experience problems, let your neurosurgeon know, because, within reasonable limits, hospital admission dates are negotiable; bear in mind, however, that other patients with urgent or life-threatening conditions will have priority.

Usually you will be asked to go into hospital a couple of days before surgery. Before the operation, you won't be able to eat or drink anything for a few hours. An anaesthetist - the person responsible for putting you to sleep during the operation - will provide you with information about what the anaesthetic involves and also discuss your general health and wellbeing.

You might have to have your head partly shaved, and this will be the surgeon's preference for working. Remember, hair grows! If you had a healthy head of hair to start with, it can take as little as a month to have a covering again. After the operation, you will have a surgical cut in your head that the doctors have made to get to your brain via your skull. This may have a dressing or bandage on it when you wake. The cut is usually within the hairline, so when your hair grows, it should become hidden.





## After the operation

After surgery, you will be monitored carefully. When you wake, your head may be bandaged. You might feel sick, or have a headache and you will have an intravenous tube attached to provide you with fluids. Staff can give you regular medication for pain. The headache, which is normal considering you have just had brain surgery, should disappear after a day or two but may last much longer. You might feel tired and sleepy and you might not want to have lots of visitors at this time.

There can be other side effects after the operation, including an aching jaw, strange sensations in your head (such as swishing), and swelling and bruising where the surgical cut is.

There's no set time you'll be in hospital. Staff will continually monitor you and when they are happy with your progress, you'll be able to go home.

## Coming home

Make sure you can relax when you return from hospital. You'll have a post-operative check around 6-8 weeks after surgery after which, if you want to, you can gradually begin to introduce activities back into your life, such as sport. Extreme sports should be avoided. If, however, after 12-24 months, you are doing well, even extreme activities can be contemplated.

You might have a seizure in the first few weeks after your operation. This doesn't mean surgery hasn't been successful - generalised tonic-clonic seizures which happen at this time are generally not considered by doctors to be an indication of failure. They may instead reflect the fact that your brain has been through the trauma of being operated upon. You will probably be kept on medication for at least a year, and up to two years, and then gradually taken down from your dosage over a further year if you elect for this.

## Chances of success

The period after surgery is likely to be difficult. Depression may occur in the first year, and the risk of this is higher if you don't have a reduction in or control of seizures afterwards. This could be intensely disappointing when your hopes have been high, and it is possible it could happen. On the brighter side, be reminded of the high success rate of the procedure.

This might sound strange, but coping with the success of the operation can be difficult too. If epilepsy has been to blame for all of life's problems, you may find that if it disappears, and the problems still remain, you can feel disillusioned. Expectations are high (my life would be 'such and such' if I didn't have epilepsy) and the way people relate to you may also change (were your relationships influenced by your epilepsy and/or were people more patient, or more sympathetic, and now aren't?).

The 'outcome' of surgery is measured not only in the reduction or elimination of seizures. They will also consider how well your brain functions afterwards in terms of memory and so on, and how your quality of life has improved because of the operation.

It's important you get the support you need during this time, which may, if you are ready to embark on finding out about surgery, seem a long way in the distance. Whatever stage you're at - good luck!



## **Carl, a warehouse operative has been seizure-free since undergoing temporal lobe surgery in 1988.**

“My seizures began during my school years, and by the age of 17, it looked unlikely that my epilepsy was going to disappear naturally. Instead, the simple and complex partial seizures I experienced were becoming more of a burden to my life.

At the age of 18, I was referred to a specialist epilepsy clinic. At my first appointment, a specialist informed me about something I had in no way expected to hear: there could be a chance they could operate on my brain and actually remove the point from which the overflow of electrical impulses was originating - providing it wasn't too close to a delicate, essential area in my brain.

I had to undergo a number of different examinations to assess chances of success. The test I remember most was the WADA test. I was shown several simple objects and asked to remember what I'd seen. An anaesthetic drug was then injected into my body. For a few minutes, the left side of my brain was put to sleep. Although feeling very drowsy, I was able to answer questions about what I'd seen. This confirmed I had sufficient memory in my right temporal lobe.

I lay awake in bed at night, praying that the results from the rest of the tests would turn out to make me suitable for surgery. After weeks of tension, my prayers were answered. I was given an appointment with a neurosurgeon for a run-through discussion about the risks and benefits of temporal lobe surgery.

I was put on a waiting list, which lasted seven months. During this period, I suffered quite badly with stress and anxiety, experiencing many contrasting thoughts and views about the operation, some being positive ones of a much better future, others being frightening ones of disaster, pressuring me not to go ahead. Finally, the time arrived where if I wanted the operation, I had to sign the authorisation form to go ahead. This was, and I'm sure will remain, the hardest decision of my life.

On the morning of Monday 1st February, my operation took place. I vaguely remember coming round from the anaesthetic to hear my mother's voice saying, “He can speak!” In my case, one of the low percentage risks had been that of interference with my speech as the section of my brain on which the surgery was being performed lay close to that responsible for speech control.”

**“My recovery was relatively quick. I was back on my feet and, apart from the obvious headache, I didn't feel too bad, just tired and bewildered after taking such a courageous step forward.”**

“The part of my skull which had been temporarily removed during surgery was a piece situated between the left eye socket and the jawbone connection. I found that for a short period of time, I was unable to open my mouth to its full capacity; I also found that if I opened my eyes wide, only the right eyebrow rose. Again, this was a temporary effect and, during its short term presence, was viewed with humour.

I didn't feel energetic enough to do anything for a few days, and probably appeared miserable in the eyes of those who came to visit me. My stitches were removed after six days and I was then discharged. My local GP provided me with a sick note for 12 weeks, during which I was advised to take it easy. It was now time to wait in hope to see if the operation had been successful.

After a year being free of seizures, my consultant decided that it was time to start reducing my antiepileptic drugs. He explained clearly that this had to be a gradual process as too sudden a reduction in drugs could lead to withdrawal effects. My daily dose was reduced by half a tablet once every two months, and I soon began to notice a remarkable improvement in my memory and a reduction in tiredness throughout the day.

I remember taking my final half tablet on the 5th December 1990 – my birthday. No present will ever match its value. After a further three check-up appointments, I was finally told I no longer needed to visit the clinic. My treatment had been a total success.

It took me some time to believe that my seizures had truly ceased. My life was getting better by the day. One thing I'd always had an ambition to try was mountain walking and it wasn't long before I became a member of the local walker's group. I am now happily married with a house of my own and a full time permanent job. In September 1998, my wife Mandy gave birth to our first child, Hannah.

**“What more could I possibly wish for?”**





**Ann, a qualified teacher and school learning mentor, had one seizure two years after an operation on her temporal lobe. However, she suffered complications after surgery.**

“At the age of 27, having had epilepsy for nine years, it got to the point when I was having seizures three times a week. It seemed my seizures were becoming more frequent and it occurred to me that eventually, I may be having one every day. The hospital changed my medication, but this didn’t help and I felt this was a no hope situation.

I was referred to a specialist centre, which put me through tests to see whether or not they could operate to remove damaged tissue from the brain. The tests were successful and I was operated on to remove the part of my temporal lobe causing the seizures.

There should have only been one operation, but due to complications caused by infection, I required six further operations. This was preferable to the seizures increasing and thankfully, the NHS didn’t keep me waiting long.

After the first operation, it was 10-14 days before I regained the ability to speak. My mother found this very difficult to cope with, as although I was ‘talking’, I was not making any sense whatsoever.

My husband thankfully believed I was going to be myself again. I found this very reassuring. I remember being able to read words, but not being able to read all of the words in a book. I was unsure for the next four to five years that I would ever feel ‘normal’ again.

The outcome of the operation affected my confidence a lot. I see this lack of confidence in the young people I now work with as a learning mentor. I have felt the effect of that lack of confidence first hand. I needed people to see the potential in me before I could even begin to see it in myself.

This has now changed to me seeing the value in myself, personally and professionally. I can see my own potential and see potential in my students. It also helps to see that someone else believes in you too. My own experience of having a lack of confidence - a ‘learning difficulty’ - over a few years, has taught me that the right attitude, encouragement and teaching can move the problem from the person to the solution.”

**“Following my operation, I suffered memory problems and had to find new strategies to remember things; one of the most successful was putting things into tunes. I have been able to pass some of these strategies and methods onto my students.”**

“The big thing with me was that I did feel I had a problem, which I had to admit to be able to get help. I had to find the right resources, one of which was the Drop-in Study Centre at the college where I work. I had to swallow my pride and go back to Maths and English at stage one.

A friend who had the right attitude saw potential in me, and helped me get past problems step by step. There have been other ‘knock on’ effects to my life. As I have organised my work, I have organised my life more, and I have achieved two City and Guilds and the Certificate of Education. My own experience has taught me that you can get past any barriers if you want to, if you put your mind to it and believe you can.”

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**These two diverse experiences clearly demonstrate the physical and emotional strains that can be encountered when undergoing epilepsy surgery.**

**The fact is that they only add fuel to the concept that it is you and only you who has to make the final decision as to whether to take the plunge and go for it.**



# Finding out more

Interested? If you are already seeing a neurologist, ask about your potential suitability. If you aren't on the lists of a specialised clinic or hospital, ask your GP for a referral to a specialist clinic, if there is one in your area.

## Glossary of Terms

### **Anaesthetic**

Drug used to cause unconsciousness and/or insensitivity to pain.

### **Anaesthetist**

Doctor skilled in the administration of local and general anaesthetics.

### **Artery**

Blood vessel conveying blood away from the heart to any part of the body.

### **Aura**

Symptoms providing a warning that a seizure is about to happen which can take the form of a strange sensation, such as a taste or smell.

### **Blood vessel**

A tube (such as an artery or vein) conveying blood.

### **Cerebral hemispheres**

The two major halves of the brain. The left hemisphere controls the right hand side of the body, the right vice versa.

### **Cerebrum**

The largest part of the brain, divided into hemispheres (see above). It is from this that seizures arise.

### **Complex partial seizure**

A partial seizure (see later) in which conscious level is affected, typically a temporal lobe seizure. Consciousness may be impaired.

### **Corpus Callosum**

Curved band of nerve fibres connecting the two cerebral hemispheres.

### **Corpus Callostomy**

Operation which cuts the Corpus Callosum so electrical discharges don't spread.

### **Depression**

Mental state characterised by persistent feelings of sadness, loneliness, despair, and low self-esteem.

### **Diagnosis**

Identification of the nature of a disease causing a set of symptoms.

**EEG**  
Electroencephalogram: test which records and measures the electrical signals in the brain providing a picture of whether that activity is 'normal' or the signals are not being sent in the right order.

**Encephalitis**  
Inflammation of the brain, most commonly from infection.

**Frontal lobe**  
Large, foremost part of the brain.

**Frontal lobectomy**  
Operation to remove part of the frontal lobe.

**Generalised seizures**  
Seizures which affect the whole of the cerebrum.

**Hemispherectomy**  
A surgical procedure which removes a cerebral hemisphere.

**Intravenous**  
Within/into a vein. An intravenous injection of medication achieves rapid action.

**Lesion**  
Widely-used term meaning an injury, wound, infection etc., affecting a part of the body.

**Meningitis**  
Inflammation of the membranes of the brain or spinal cord.

**MRI**  
Magnetic Resonance Imaging - a type of scan which produces images of the brain which are then put into a computer. It involves the use of a strong magnetic field, hence the name.

**Neurology**  
Branch of medical science concerned with the nervous system and its disorders.

**Neurologist**  
Medical doctor specialising in the brain and nervous systems.

**Neuropsychologist**  
Specialist in the scientific study of behaviour and related mental processes, working within neurology.

**Neuropsychometry**  
Measurement of psychological functions i.e. memory, aptitude, concentration and so on.

**Neurosurgeon**  
Surgical doctor specialising in the brain and spinal cord.

**Paediatric**  
Specialism in childhood diseases/disorders and the health/development of children.

**Paediatrician**  
Doctor specialising in childhood diseases and disorders and the health and development of children.

**Partial seizure**  
Seizure which occurs when abnormal electrical activity occurs in a part of the brain, previously called a focal seizure. Consciousness levels are not always affected.

**Psychiatrist**

Doctor specialising in the diagnosis and treatment of mental disorders and emotional/behavioural problems.

**Secondarily generalised seizure**

Partial seizure which spreads and so becomes generalised.

**Seizures**

Episodes which occur when electrical activity in the brain becomes uncontrolled.

**Simple partial seizure**

Form of partial seizure in which the person's consciousness is not affected.

**Stroke**

Where a disability results from part of the brain dying, often due to an obstruction of an artery.

**Syndrome**

Cluster of signs/symptoms which occur together.

**Temporal lobe**

Areas of cerebral hemispheres lying behind the eye. Functions include speech and hearing.

**Temporal lobe epilepsy**

Complex partial seizures which occur in the temporal lobe.

**Temporal lobectomy**

Removal of the front part of the temporal lobe.

**Tonic clonic seizure**

Generalised seizure which involves loss of consciousness followed by a tonic (stiff) phase which leads to a clonic (twitching) phase.

**Vagus nerve**

One of the twelve pairs of cranial nerves which arise directly from the brain.

**Video telemetry**

Video camera linked to an EEG machine, which allows a recording of what is happening in the brain during a seizure. When the video recording is played, one half of the screen shows the person and the other the EEG recording.





