Better futures for young lives with epilepsy

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Epilepsy surgery

Only 4 or 5% of children with epilepsy are considered as suitable candidates for epilepsy surgery.

Epilepsy surgery (neurosurgery) may be considered if antiepileptic drug treatment has been shown to be ineffective and if, after a number of detailed tests, the results of these investigations show that:

- The seizures arise from a specific part of the brain that can be clearly defined and removal of this area will not cause any further problems.
- There is evidence of medical, social and/or educational disability due to the child's seizures.
- The child's quality of life is likely to improve after surgery.
- There is an acceptable risk-benefit ratio for the child undergoing surgery.

Depending on the type of epilepsy, and the part of the brain from where the seizures originate, there are a variety of surgical procedures that may be performed. The surgical success rate varies depending on the type of surgery, but it is now recognised that in many cases the earlier surgery is carried out, the better the result.

If the doctors decide that surgery is an option for a child, the parents will have plenty of opportunity to discuss the advantages and disadvantages with the child's surgeon. Before making up their minds, parents will be told all the risks and benefits of surgery.

If a child is able to understand the implications of the decision, they should be included in the decision-making process. It may help the parents and their child to be put in contact with another family who have been through a similar surgical procedure. They will have an insight into how the parents are feeling and possibly make them, and their child, feel reassured about the procedure if they decide to go ahead with surgery. The child's epilepsy team may be able to arrange this contact.

Resective surgery

The most common type of operation is known as resective surgery. This type of surgery involves removing lesions, structural abnormalities, or parts of the brain that are causing the seizures to occur.

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These operations include:

- **Lesionectomy** – removal of a lesion or area of injury or damage to the tissue structure, e.g. a tumour or a cyst.
- **Focal resection** – removal of the area of origin of seizures.
- **Lobectomy** – removal of a lobe of the brain. This is usually a large part of the temporal or frontal lobe.
- **Hemispherectomy** – one side of the brain is either removed or disabled. This is not a common type of surgery, but is used to treat very severe epilepsy in children where they already have damage to that hemisphere.

Disconnection procedures
(also known as palliative procedures)

A palliative procedure is one that is aimed at limiting the spread of seizure activity or reducing seizure frequency, but does not provide a cure. This type of epilepsy surgery involves disconnecting the area of the brain in which the seizures arise from the surrounding area. By carrying out this procedure the spread of seizure activity across the brain should be restricted.

These operations include:

- **Corpus callosotomy** – the fibres that connect the two halves of the brain are known as the corpus callosum. These fibres are cut to prevent the seizure activity spreading throughout the brain. It is usually performed on children who mainly have debilitating seizures that cause frequent falls and injuries.
- **Multiple subpial transections** – fine cross section cuts are made across areas of the brain thought to be causing the seizure. This 'cross-hatching' can prevent the spread of seizures without affecting vital functions. It is usually done in conjunction with resection.

Pre-surgical investigations

If a child is being considered for surgery, there are a number of extra tests that may be undertaken. These tests will be done to discover if the child's seizures start from a specific part of the brain which can be removed easily, and without damage to other important areas. It is vital to determine the exact function of affected areas, and some of the investigations listed over the page may be used.

Almost all children are anxious about medical procedures so it is important that parents speak to the child's healthcare team prior to the investigation to ask them for resources that will help explain the procedures.

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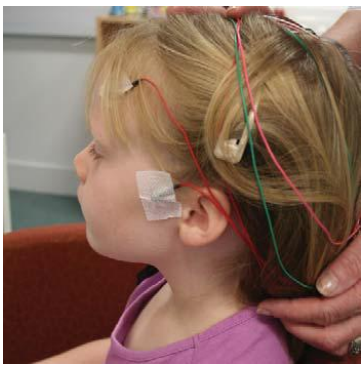
They may also be able to give tips on how to prepare the child and, if necessary, organise sessions with a play specialist or therapist who will be able to help alleviate anxiety.

Video Telemetry
The purpose of video telemetry is to record a seizure with a simultaneous video recording and a time-matched EEG, so that the nature of any seizures or episodes can be clarified.

It involves an overnight stay for the child in a hospital or specialist centre. The aim is to capture day and night-time events on video and EEG, so that the episodes can be confirmed or eliminated as being epileptic in nature.

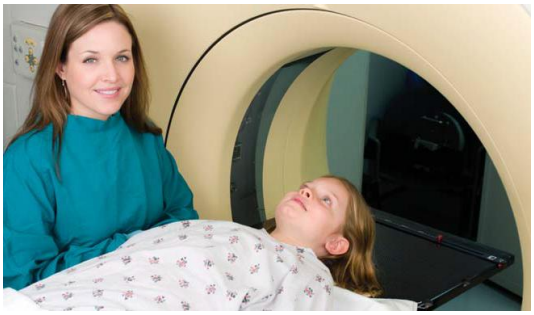
This investigation is also useful in pre-surgical evaluation to confirm where the seizures are coming from.



MRI scan (Magnetic Resonance Imaging)
This scan uses magnetic fields, rather than X-rays, to form an image of the structure of the brain and gives more detail than a computerised tomography (CT) scan. It is the scan of choice for epilepsy as the image is sharper, and can reveal far smaller structural abnormalities than a CT scan.

The disadvantage is that it takes longer and is noisy. Many children need sedation or anaesthesia prior to an MRI scan because it is important that they lie still for some time. Some children may be unsettled by the noise or feel claustrophobic when in the scanner.

Functional Magnetic Resonance Imaging
(fMRI scan)
Whilst a good MRI scan can show detailed pictures or internal body structures and single or multiple areas of abnormality, an MRI scan with functional imaging (fMRI) is also able to look at the blood flow in a specific area of the brain.



When brain activity occurs in actions such as thought, speech, movement and sensation, there is an increase in the blood flow to the area that is activated.

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This makes the fMRI extremely useful for mapping the brain for its various functions and for locating a focus from where seizures originate.

Single Photon Emission Computed Tomography (SPECT scan)

The SPECT scan is an imaging test. During the test a computer collates the images and shows them in cross sections. These can be added together to form a 3D image of the child's brain.

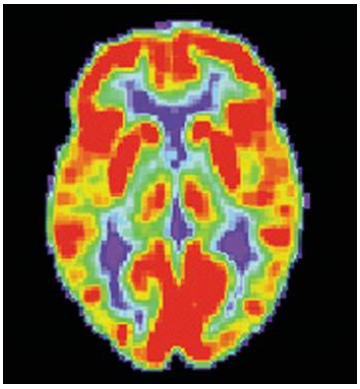
Because a SPECT scan can show areas of reduced blood flow, this type of scan is more likely to pick up brain injury because there is likely to be reduced blood flow to the affected area.

During this test a chemical will be injected into the child's bloodstream which gives off gamma rays.

When scanning is then performed, the blood flow through the arteries and veins in the brain can be traced. If this test is done during a seizure, it will show where in the brain the seizure started. It is also done in between seizures to give a comparison reading.

Positron Emission Tomography (PET scan)

PET scans are more precise than SPECT scans. They are able to show how the tissues in the brain are functioning by looking at glucose metabolism. The scan is able to show areas of low metabolism that may be structurally abnormal, but which do not show up on an MRI scan.



The advantage of this test is that it is non-invasive and may eliminate the need to have electrodes implanted directly onto the brain's surface as in the intracranial EEG. Unfortunately these scans are not widely available at present

Intracranial EEG telemetry (implanted EEG electrodes)

This form of invasive monitoring is another way of confirming the area of the brain from which a child's seizures arise. It is used when the exact area is not clear or because of the proximity of the area to functional centres of the brain.

This procedure involves the child having an anaesthetic and an operation to place electrodes in strips or grids directly over the surface of the brain. These electrodes are then connected to an EEG machine and the child's brain activity is monitored over several days.

This test will also allow the epilepsy team to carry out 'functional brain mapping' enabling them to check exactly which areas of the brain the child needs for essential tasks such as movement or speech.

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