

# Invasive monitoring

A young child with dark, curly hair tied in a small ponytail is sitting on a light blue surface. The child is wearing a black short-sleeved shirt with white polka dots and blue jeans with red overalls. They are focused on playing with colorful plastic blocks. One green block is held in their right hand, while their left hand is reaching towards a pile of blocks on the floor. The background is a plain, light blue wall.

Information for families

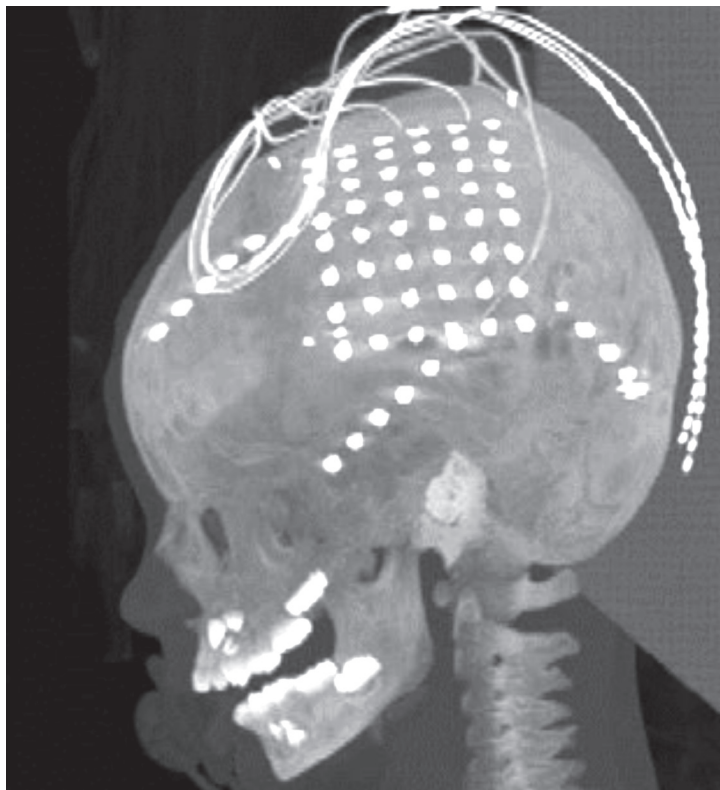
**Great Ormond Street Hospital  
for Children NHS Foundation Trust**

**This leaflet explains about invasive monitoring for epilepsy and what to expect when your child comes in to Great Ormond Street Hospital (GOSH) to have this procedure.**

### **What is invasive monitoring?**

Invasive monitoring is a very specialised and detailed way of confirming the exact area of the brain causing your child's seizures (fits) and the exact areas of the brain being used for important tasks such as speech or movement. Invasive monitoring involves an operation to place electroencephalogram

(EEG) electrodes, directly over the surface of your child's brain (grids or strips), or into the brain itself (depth electrodes). These EEG electrodes are then connected to an EEG (electroencephalogram) monitor so that clinical physiologists can record your child's brain activity over several days.



## **Why does my child need this test?**

The procedure will be carried out if doctors think that your child's epilepsy might be relieved by an operation to remove part of their brain but previous tests have not been able to determine the exact area or we believe the area involved may have an important function.

Previous tests will have already given the team some idea which area of your child's brain needs closer observation. This test will confirm which area of your child's brain is causing seizures. Invasive monitoring can also allow the epilepsy team to carry out 'functional brain mapping'. This mapping allows the team to check exactly which areas of the brain your child needs for essential tasks, like movement or speech. This is important to know, as it indicates whether surgery to help their epilepsy would put these functions at risk.

## **How do the doctors decide if my child needs this procedure?**

Once the epilepsy team has seen all the results from previous tests they will discuss whether invasive monitoring will help them to decide whether surgery is an option for your child. You will be asked to attend the epilepsy surgery clinic to discuss this with the team. At this clinic you will meet both a neurologist and a neurosurgeon and we will explain fully the risks and benefits of the test to you and your child. We will send you a letter following your epilepsy surgery clinic appointment summarising the benefits and risks of surgery for your child.

The epilepsy team will then ask you to think about the information given to you and decide whether you want your child to have this procedure. When you have decided, please ring the Nurse Practitioner for Complex Epilepsy and write to the neurosurgeon to confirm that you wish to proceed. The team will then plan a date for the test and offer you the date by letter.

## What are the risks of this procedure?

Your child will be given a general anaesthetic (which puts them deeply to sleep) for the operation to put the electrodes in place.

Healthy children usually cope well with the anaesthetic, but the risk increases if your child has other health problems. However, the specialist doctors (anaesthetists) who look after your child during the operation will keep any risks to a minimum. Your child may feel sleepy, dizzy or sick afterwards. Children are routinely given medicine for sickness and for pain.

This operation has a slightly higher risk of infection than others because of the electrode wires exiting the head; the risk of infection is 10 to 15 per cent. There is a small chance of bleeding either over the surface, or within, the brain. Occasionally, if this bleeding is putting pressure on the brain, a further operation may be needed to remove the blood. There is also a small chance of surgery causing damage to the brain.

After the operation to put the electrodes in place, it is sometimes necessary to reduce or stop your child's antiepileptic drugs during the days of invasive monitoring. This is so that your child is more likely to have a seizure while in hospital. The doctors will decide this with you when you and your child come into hospital for the test.

If your child has had a number of seizures recently, even though they are taking antiepileptic drugs, he or she may be able to continue taking them during the test.

There is always a risk in reducing or stopping your child's drugs suddenly for this test, as it may cause your child to have a longer or more intense seizure than usual. However, the doctors and nurses will monitor your child closely to try to stop this happening and an emergency medication plan will be in place to ensure your child's safety.

## **Are there any alternatives to this procedure?**

Your child's doctors can tell a lot from an EEG and other tests and brain scans, but invasive monitoring can help them to be sure exactly which part of your child's brain is responsible for their epilepsy. This is particularly helpful where brain scans have not shown an abnormality or where the doctors are concerned that seizures may be starting near an area that is also controlling one of your child's useful functions.

## **What happens before the operation?**

Before the operation, we will ask you to arrange a blood test with your family doctor (GP) to ensure your child is fit for surgery.

You will need to come to Koala Ward the day before the operation. This is to make sure that your child is well enough to have the operation. A doctor will examine your child and may take a repeat blood sample

to check that his or her blood parameters (for example, clotting tests, full blood count) are fine. The neurosurgeon will explain about the surgery in more detail, discuss any worries you may have and ask your permission for the operation, by signing a consent form. Another doctor will also visit you to explain about the anaesthetic.

Occasionally, some children need neuropsychology testing and a further scan before the operation, but we will let you know if this is likely before you come into hospital. If your child has any medical problems, for instance, allergies, please tell the doctors about these. If your child has had any infectious diseases like chicken pox or head lice recently, please tell the doctors. The procedure may be cancelled if head lice have not been treated successfully before admission.

Before the operation, your child will need to have a bath and a hair wash with a special soap.

## What does the procedure involve?

The operation to insert the electrodes will be carried out under a general anaesthetic. This means that your child will not feel any pain during the operation. Your child's head will not be shaved completely, just a line where the doctors will make the incision (cut). This will be done while your child is under the anaesthetic. If your child needs electrode grids, the surgeon will open a trap-door in your child's skull to place the grids over his or her brain. The bone will be fixed back in place at the end of the procedure. If your child needs depth electrodes, the surgeon may drill small holes in your child's skull to thread these into his or her brain.

After the operation, your child will have many wires coming from the wound in his or her head. These wires will be fastened with tape and bandages so that they cannot be pulled out of place while your child is on the ward. Also, your child will have a nurse with them 24 hours a day to make sure this does not happen. Your child will usually have a CT scan immediately after the electrodes are inserted to check their position.

Once the operation to insert the electrodes is over, your child will stay on Koala Ward in one of the telemetry rooms. He or she will be connected to the EEG and video monitoring equipment for up to seven days, while the clinical physiologists confirm which area of the brain is causing your child's seizures.

You may notice that your child's face is a little swollen. This is temporary and will begin to improve after two to three days. Your child may also feel, or be, sick after the operation to insert the electrodes and may need some medicine to treat this.

The clinical physiologists will let you know if they are planning to carry out functional brain mapping. This involves the clinical physiologists and doctors stimulating areas of the brain by way of the electrodes. This will make sure that none of the areas of the brain which are planned to be removed have important functions, especially for movement in the hands or legs.

Your child will have their own nurse for this time, who will look after and monitor them closely. He or she will take various measurements like blood pressure and heart rate every hour while the electrodes are in place and also take blood samples for testing. Your child will probably have an intravenous drip until he or she is drinking enough fluids.

## **What happens after the procedure?**

Your child's stay in hospital, including surgery if needed, is likely to last between 11 and 12 days. Once the clinical physiologists have carried out all the monitoring, the epilepsy team will discuss the results with you. This will include whether the area responsible for seizures has been located, whether an operation can be offered and what risks there are. In 20 per cent of cases, despite invasive monitoring, it is still not possible to identify the area where the seizures are starting. If this is the case we will remove the electrodes at the end of monitoring but will not be able to perform resective surgery.

If you, with the team, decide that removing an area of the brain could help your child, this will usually take place at the same time as removal of the electrodes. If it is felt not to be of benefit to remove any brain tissue, surgery will take place just to remove the electrodes.

## Notes

**If you have any questions or worries,  
please telephone the Nurse Practitioner for complex epilepsy  
on 020 7405 9200 Extension 1592.  
Out of hours, please call Koala ward on 020 7813 8313**

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