Neuro-Oncology Service

Living with a brain tumour: Undergoing neurosurgery

Neurosurgery explained
This leaflet explains what a brain tumour is and details some common types of neurosurgery undertaken at Addenbrooke's Hospital for people diagnosed with a brain tumour.

Your neurosurgeon and specialist nurse (sometimes referred to as your key-worker) will discuss the most suitable form of surgery for you based on your tumour size/location, your particular symptoms and current health situation.

What is a brain tumour?
A brain tumour is a collective name for an abnormal or excessive growth of cells found in the brain. An excessive growth of normal brain cells are collectively referred to as benign tumours, whereas excessive growth of abnormal brain cells, are known as malignant tumours. There are many different types of brain tumours, both benign (non-cancerous) and malignant (cancerous).

What is a primary or secondary brain tumour?
Some people have a primary brain tumour. These types of tumours develop and arise from the brain cells themselves. This means they usually stay within the brain and generally do not spread to other parts of your body. Many primary brain tumours are benign, but there are also many that are malignant in nature.

Secondary brain tumours are sometimes also known as metastasis. These tumours occur when cancer cells from other parts of the body spread into the brain. Most metastasis to the brain are cancerous tumours. As part of your ongoing investigations, you may have had a scan of your chest, abdomen and pelvis area. This is to see if there is evidence of active disease in other parts of your body. Examples of brain metastases include those from a primary lung, breast, or perhaps bowel cancer.

What kind of brain tumour do I have?
A diagnosis of a brain tumour can usually be made radiologically. This means undertaking a brain scan (either CT or MRI). This is generally undertaken at your local hospital.
Your scan is then viewed by a neurosurgeon as well as other brain specialists in a multi-disciplinary review meeting (MDT). You will then be seen by a member of the MDT in order to discuss the results of the scan and the best way to treat your tumour. You will only see a neurosurgeon if there is a surgical option for your tumour.

There are however, over 150 different types of brain tumours. Therefore the only way to diagnose the exact type of tumour you have is to remove a sample of your tumour as part of a surgical procedure, and examine it under a microscope. We need to establish the type of tumour you have (name, grading and molecular subtype of your tumour) so that we can plan for further treatment, if this is required.

This leaflet explains the various surgical treatments we have to offer. The option most suited for you will be discussed directly with you and your family/carer. This mainly depends on the size/location of your tumour and your overall health.

**Pre-admission clinics**

Once you’ve had your first outpatient clinic consultation with your neurosurgeon, you should have a clearer picture about what form of neurosurgery is most suitable for you.

To help facilitate your surgery admission, you may need to have tests including blood tests, echocardiogram (a tracing of your heart rhythm) and a chest x-ray amongst other things undertaken in order to ensure you are well enough to undergo surgery.

We try and get as many of these tests done in a clinic setting before your admission in order to minimise any delays to your surgery date and subsequent discharge and follow-on care (if required). This is often referred to as a pre-admission appointment. Please bring a list of all your current medication with you to this clinic and inform us if you are taking any blood thinning agents such as Aspirin, Clopidogrel or Warfarin.

You will be responsible for your own transport arrangements to and from this clinic, as well as for your surgical admission. If you do not have any friends / family that can bring you in, and if you are unable to use public transport, you must arrange transport via your GP. You are not allowed to drive unless you have been told otherwise by your neurosurgeon.

We only arrange pre-admission clinics if you are deemed well enough to attend as an outpatient. If you are an inpatient in another hospital awaiting your surgery with us, we will arrange all tests between ourselves and your transfer across to us.

**On admission to Addenbrooke’s Hospital**

Patients are usually admitted as close to their surgery date as possible. This is usually the day before or sometimes even the morning of your planned surgery. You are responsible for arranging transport for your admission and again home from hospital. Please inform us at your earliest opportunity if this is a problem.
On admission you will be assessed by a doctor and a ward nurse. You will also meet the anaesthetist who will ask you questions regarding your general health, allergies, previous operations and past reactions to any drugs (if applicable). You will have the opportunity to ask any questions you may have about the anaesthetic.

You will be kept fasted (nil by mouth) for at least six hours of food and drink prior to your operation. **However, you must take all of your prescribed medication as per normal, even on the day of surgery.** If you are diabetic you will be kept on an insulin chart and monitored closely. Please speak to your specialist nurse if you have any questions regarding your medications, admission or surgical procedure.

**What is a stealth scan?**

This is a very detailed scan often used by neurosurgeons to help pinpoint the precise location of your tumour. It will help avoid disturbing other parts of your brain that remain unaffected by your tumour.

The information from this scan is entered into a computer once you are in theatres. Once asleep, you will have your head secured in a frame to prevent it from moving during the operation.

This frame has focus points (also known as fiducials) which are ‘seen’ by the computer. Together with your scan results, they generate an exact, three-dimensional (3D) image of your head and brain, including your tumour. It will help the surgeon find the best way to access your tumour safely.

Most patients undergoing neurosurgery for a brain tumour will either have a stealth MRI or stealth CT as part of their assessment.

**What is a craniotomy?**

A craniotomy is where the surgeon makes an incision in your scalp (skin) before temporarily removing a small piece of your skull-bone in order to expose your brain. This temporary removal of your skull-bone is known as a craniotomy. It is sometimes referred to as a bone-flap. This operation is done under general anaesthetic. In most cases, a craniotomy needs to be performed in order to gain access to your brain tumour.

The size and shape of the opening will depend upon the size and position of your tumour. Where possible an incision will be made behind the hairline so that the scar is hidden when the hair grows back. Once you are asleep the area around this craniotomy site will be shaved. The surgeon will do their best to minimise how much hair is shaved.

After the surgery, the bone piece is replaced and fixed back in place with small titanium bio-plates and screws. There is no chance of the bone coming out once it has been secured. The scalp incision is closed with sutures and a wound dressing applied.
What is an awake craniotomy?

This procedure is carried out much like the above craniotomy but with you, the patient, being awake for part of the operation. You will only have an awake craniotomy if your tumour is in, or near, the vital parts of your brain that control your speech and language. This option will be discussed directly with you and your family/carer if applicable.

What does a biopsy involve?

A biopsy is the removal of a sample of tissue. This tissue is examined under a microscope and enables a diagnosis to be made.

A biopsy is only ever carried out if a resection or debulking procedure is not possible, but a diagnosis is still required. This will help to plan any further treatment that may be needed, such as radiotherapy or chemotherapy.

During a closed biopsy procedure, a small hole (called a burr hole) is made in the skull. A sample of tissue is obtained by passing a needle through this hole and into the tumour. The skin over the wound is stitched and the bone grows back over the small hole in the skull in a few months.

A craniotomy and biopsy may also be referred to as an open biopsy. A craniotomy is performed (see above) before several large samples of the tumour are taken, typically from each tumour quadrant.

Excision or debulking (partial resection) surgery

During an excision procedure the surgeon performs a craniotomy and then removes the tumour in its entirety before replacing the bone-flap and closing the surgical wound with sutures. This type of surgery is mainly done if the tumour has well defined margins and is easy to remove.

Sometimes it is not safe for the surgeon to remove your tumour in its entirety. This depends on the size and location of your tumour, and if it has poorly defined margins. This makes a complete removal of your tumour much more difficult. This procedure is referred to as a partial resection or debulking procedure.

We aim to debulk as much of the tumour mass as is safe. Typically, around 90% of the tumour mass is debulked.

Sometimes surgery is all you will require in terms of treatment. Where benign tumours are concerned, surgery may even be a curative process.

On other occasions, tumour excision or debulking is done to help reduce the overall tumour mass (burden). This will allow other treatments such as radiotherapy and/or chemotherapy, to work better. All these options will be discussed with you if applicable.
5-ALA guided resection

In some cases your consultant may feel that a more complete removal of your tumour could be achieved using a substance called Gliolan® (5-ALA). 5-ALA is a drug that can help identify the edge of the tumour. It is diluted in normal water and drunk between three and five hours before the operation.

5-ALA goes into the tumour cells of the brain but not the normal brain tissue. In the tumour it is converted to a substance that glows pink when exposed to blue light. During the operation the surgeon will use a blue light filter on the surgical microscope. This helps identify remaining tumour cells which can then be removed. Your neurosurgeon and key worker will discuss this option with you if applicable.

Intraoperative neurophysiology (brain mapping)

If your tumour is near a part of your brain involved with controlling your movements, (such as arm or leg movement), we utilise the expertise of a specialist monitoring team called neurophysiology. Once you are asleep and your tumour is visible, they place electrodes onto the surface of your brain. This specialist team then pass small electrical currents through these electrodes, which in turn stimulate your arm or leg muscles. The surgeon can then ‘map’ the areas of your brain that control movements, in connection to the location of your tumour. In reality, this means your surgeon may deliberately leave some tumour behind, if neurophysiology can confirm permanent damage to your movements would be caused by removing it. Treatments for remnant tumour tissue will be discussed with you, once the diagnosis and all treatment options are established. Please speak to your neurosurgeon or specialist nurse if you have any questions around this.

Neuropsychology

If you are due to undergo an awake procedure, you will be referred to our neuropsychology teams for a baseline cognitive assessment, prior to your operation. This means the neuropsychology teams asses how the tumour has affected your speech, memory and other cognitive functions. It gives them a ‘baseline’ understanding of your ability to name objects and memorise items before surgery. During your awake procedure, the same team are present at the operation and will go through the tests with you again, allowing them to detect even minor speech errors. They feed this information back to your surgeon in ‘real time’ who will be guided by the neuropsychologist’s feedback. This helps minimise any long term damage to your speech and language part of your brain. Once surgery is completed, neuropsychology will arrange to review you once more in clinic a few months after surgery to see how you are recovering, and help put process in place to improve cognitive function, as (and if) required.
How long will my operation take?

This depends entirely on the size/location of your tumour and the type of operation you have had. In most cases you will be gone from the ward for several hours. We are not allowed to ring theatres to find out how your operation is progressing as this may disrupt the surgery. The phone lines need to be kept free for operating staff.

Your anaesthetic procedure (where your anaesthetist puts you to sleep) takes around an hour. This is done in the anaesthetic room next door to the operating suite. During this part of your surgery they also insert most of the blood lines and monitoring equipment (such as a urine catheter) that will be required during the operation.

On average, a craniotomy and debulking procedure takes around four hours. This is in addition to your anaesthetic procedure. A biopsy will take around two to three hours in addition to the anaesthetic procedure. All in all you may be away from the ward for around six hours, sometimes more.

Waking up after surgery

You will wake up in/be taken to the recovery suite of the operating theatre as soon as surgery is over. Visitors are not allowed in this area. You will be recovered there until your sedation has worn off and you are awake enough to return to a ward.

Depending upon your procedure, the underlying condition and any possible complications during or after your operation, you will be transferred back to either a ward, our High Dependency Unit (HDU) or our Critical Care Unit (NCCU) for a period of time.

Discharge and follow-up with results

Once you have recovered from your procedure you will be discharged home or transferred back to your local hospital. Providing your surgery has been straight forward we anticipate you will be able to go home in a matter of days.

The biopsy or a sample of your tumour will be sent to a histopathologist. This is a doctor who specialises in examining cells. The tests take seven to ten working days. The results tell us two things: first, the type of cells that make up your tumour and second, how these cells are behaving (such as how quickly they are dividing and whether they are a threat to normal cells).

We recognise that this is a very stressful time. As soon as the results are known you will be invited to the next available outpatient appointment. **We do not give results over the telephone.** To minimise delays we will contact you by telephone and invite you to the next available clinic.

We are a part of a region-wide team who treat brain tumours. This means that you get the best care possible.
By the time we see you in clinic the team will have discussed your results and either your surgeon or your key worker will discuss the team's recommendations with you. It is not always easy to remember everything so it is a good idea to bring someone with you. You may also find it useful to bring a note pad and pen with you to make notes.

Contact details

Please do not hesitate to contact any of the numbers below, during office hours, if you have any questions or concerns regarding any aspect of your neurosurgical care. We are here to help.

- **Neuro oncology specialist nurses** (direct dial with answering machine): 01223 256246 or via Addenbrooke's contact centre 01223 245151 via bleep 154-506 or 152-090
- **Team secretary** (direct dial): 01223 216780

Other formats:

If you would like this information in another language or audio, please contact Interpreting services on telephone: 01223 256998, or email: interpreting@addenbrookes.nhs.uk For Large Print information please contact the patient information team: patient.info@addenbrookes.nhs.uk

We are a smoke-free site: smoking will not be allowed anywhere on the hospital site. For advice and support in quitting, contact your GP or the free NHS stop smoking helpline on 0800 169 0 169.

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