CRANIOTOMY

A guide for patients

A craniotomy is an operation to temporarily open part of the skull in order to expose the brain for surgery. Craniotomy may be the first line of treatment for some conditions and injuries affecting the brain.

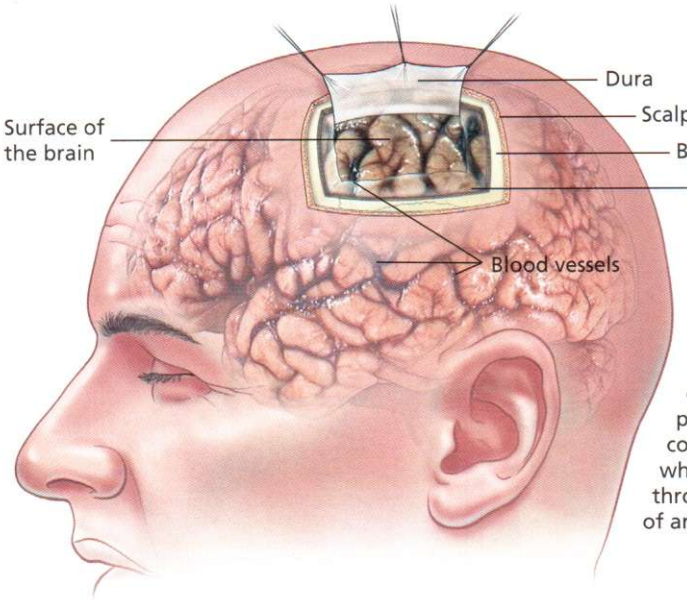
Advances over the past 20 years have made craniotomy safer, simpler and increasingly successful.

Neurosurgeons are now able to operate in areas of the brain that were once thought impossible to reach.

Craniotomy is performed as a part of the surgical treatment of many different conditions. These include:

- a growth or tumour within the brain or from the membranes that surround the brain. The brain fits so precisely inside the skull that an abnormal growth that takes up space can raise intracranial pressure. This often manifests as headache. Rarely, an increase in intracranial pressure may reduce blood flow in crucial parts of the brain and can be life threatening.
- a blood clot (haematoma) pressing on the brain. This may result from a head injury. The clot can develop between the dura membrane that lines the inside of the skull and the brain (a subdural haematoma) or between the skull and the dura (an extradural haematoma).
- a weakness in the wall of an artery (cerebral aneurysm). An aneurysm is formed when the weak spot bulges like a bubble. In some patients, the aneurysm may enlarge over time, increasing the risk that it may rupture and cause major bleeding into and around the brain. Many aneurysms can now be treated with endovascular techniques performed through the leg. In some cases, a neurosurgeon may place a permanent titanium clip across the neck of the aneurysm to seal it from the normal artery. An untreated aneurysm may eventually burst and cause life-threatening bleeding into the brain.
- an infection or abscess that needs to be drained.
- epilepsy, when not controlled by medication, can occasionally be treated by removing the site (within the brain) that is causing seizures.
- Certain pain syndromes, such as trigeminal neuralgia, may be treated by decompressing a nerve being compressed by an artery
- a swelling of the brain (oedema) due to inflammation, which may be caused by a range of diseases
- a fractured skull caused by acute trauma
- a foreign object that has penetrated the brain.

In size, craniotomies can vary widely from a few millimetres (keyhole or burrhole craniotomy) to several centimetres in width, depending on the problem and the treatment needed.



The brain is protected by the skull and three membranes (meninges) between the skull and the surface of the brain: the dura mater, arachnoid and pia mater. The brain needs a constant supply of oxygen, which is carried in the blood through an extensive network of arteries and veins.

Talk to your Neurosurgeon

This pamphlet provides general information. It is not a substitute for advice from your neurosurgeon. Read this pamphlet carefully, and save it for reference. Some terms may require further explanation. Write down questions you want to ask. Your neurosurgeon will be pleased to answer them.

Although patients should be as informed as possible about the surgery, every aspect cannot be covered in this pamphlet. Every case is different. Discuss all aspects of your surgery with your neurosurgeon, including:

- the diagnosis
- whether all non-surgical treatment options have been considered
- risks, benefits and limitations of surgery
- the chances of success and failure
- the patient care needed around the time of surgery and any restrictions (such as driving) over the coming weeks
- The expected range of outcomes in the short term and long term.

Your neurosurgeon cannot guarantee that surgery will meet all your expectations or that surgery has no risk. If you are uncertain, you may wish to seek the opinion of another specialist. This pamphlet should be used only in consultation with your neurosurgeon.

Consent form: If you decide to have treatment, your neurosurgeon will ask you to sign a consent form. Read it carefully. If you have questions, ask your neurosurgeon.

IMPORTANT: FILL IN ALL DETAILS ON THE STICKER BELOW

DEAR SURGEON: When you discuss this pamphlet with your patient, remove this sticker and put it on the patient's medical history or card. This will remind you and your patient that this pamphlet has been provided. Some surgeons ask their patients to sign the sticker to confirm receipt of the pamphlet.

TREATMENT INFORMATION PAMPHLET

PEEL HERE

PROCEDURE: _____

PATIENT'S NAME: _____

DOCTOR'S NAME: _____

EDITION NUMBER: _____ DATE: D D / M M / Y Y Y Y

Your Neurosurgeon

Edition number: 2

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A special metal frame is often used to hold the head steady during the operation. Usually, only a small section of the scalp is shaved. The surgeon makes an incision through the scalp, over the affected area of the brain, to the skull.

The size, shape and exact location of the incision can vary greatly, depending on the underlying problem and results of scans and other investigations.

One example of a craniotomy is shown in Figures 1 to 4.

The surgeon uses a surgical drill to make a series of small burr holes in the skull. A special bone-cutting instrument is used to cut from one burr hole to the next, creating a bone flap (Figure 2). The bone flap is removed and kept in a sterile environment during the operation.

The membranes covering the brain are opened, and the area of the brain to be treated is exposed. Surgical instruments are used to operate on the particular condition, disease or trauma.

An operating microscope is used so the surgeon can see the fine structures. Often a "neuro-navigation" device is used to allow for more accurate localisation of the structures and abnormalities of the brain. For many conditions (such as aneurysms), the surgery is on the surface of the brain rather than deeper within the brain.

At the end of the procedure, the dura mater is sutured closed. The bone flap is usually replaced (Figure 3) and secured with small metal plates and screws. If a section of skull has been drilled away, then acrylic bone cement is needed to restore a skull defect. Repairing a skull defect is known as cranioplasty.

Finally, the scalp incision is closed with sutures or surgical staples (Figure 4).

The size, shape and location of the scalp incision depend on the diagnosis and location of the intracranial problem. The surgeon will attempt to keep the scalp incision above the hairline, but an incision may sometimes extend into the facial area and may be visible.

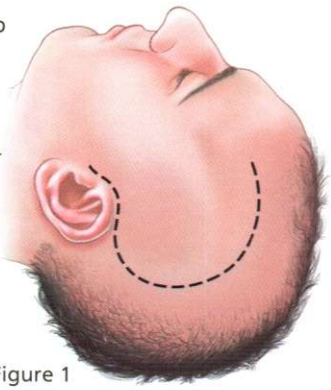

Figure 1

The bone flap is removed, and the brain is exposed for surgery.

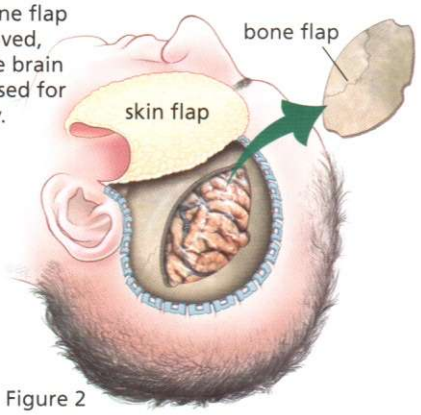

Figure 2

The bone flap is usually replaced after the surgery.

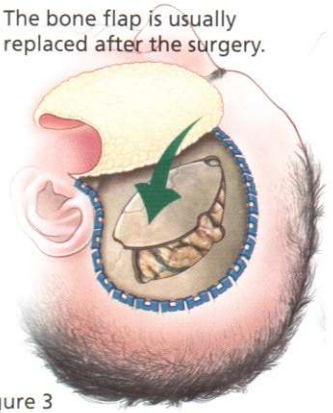

Figure 3

DIAGNOSTIC IMAGING

Advanced imaging techniques and improved computer technology have led to more accurate diagnosis, exact locating of the problem, and precision surgery. The diagnostic imaging tests most commonly used prior to neurosurgery are:

- computed tomography (CT), a non-invasive technique that provides images or "slices" of body organs by scanning them with X-rays. A computer is used to construct cross-sectional scans.
- magnetic resonance imaging (MRI), a non-invasive, non-X-ray technique that produces detailed, two-dimensional images or "slices" of body organs, particularly the brain and spinal cord. With some MRI scans, a three-dimensional image can be produced.
- angiography, which provides images of normal and abnormal blood vessels after arterial injection of a dye that is opaque to X-rays. Modern CT and MRI scans can produce high-quality angiograms, with or without injections of radio-opaque dye.
- standard X-ray examination, which produces X-ray films.

Less commonly, ultrasound studies may be used. Your neurosurgeon or radiologist can explain which diagnostic tests are needed in your case.

IMAGE GUIDANCE

Prior to surgery, it can be helpful to have a further MRI or CT scan to allow neuro-navigation or computer-guided localisation during the operation. This may involve placing small adhesive dots on the scalp followed by a brief scan. Images are then transferred to the operating room to assist the surgeon.

YOUR MEDICAL HISTORY

Your neurosurgeon needs to know your complete medical history to plan the best treatment. Tell your neurosurgeon about any health problems you might have, including:

- any allergy or bad reaction to antibiotics, anaesthetic drugs or other medicines, surgical tapes or dressings
- recent or long-term illness, including infections, and any previous surgery
- prolonged bleeding, excessive bruising when injured, or a family history of excessive bleeding
- previous problems with blood clots in the legs or lungs
- any personal or family history of deep vein thrombosis (DVT)
- thick, raised scarring or poor healing of scars after previous surgery.

Give the neurosurgeon a list of ALL medicines you are taking or have recently been taking, such as:

A cross-sectional image of the brain and head produced by magnetic resonance imaging (MRI). MRI provides precise, detailed images of the anatomy of the brain and head.

- medicines prescribed by your family doctor
- those bought "over the counter" without prescription, including "natural" medicines
- blood thinners, aspirin (including that contained in cough syrups), arthritis medication, insulin and anti-inflammatory medicines.

Some drugs and vitamins are blood thinners and can increase the risk of excessive bleeding during and after surgery. Your neurosurgeon will advise you whether doses of these medications should be altered,