

Cancer of the Brain and Brain Tumours

This leaflet aims to give a brief overview of the various types of brain tumour. The treatment and outlook vary greatly, depending on factors such as the type of tumour and the location in the brain.

Understanding the brain

The main parts of the brain include:

The cerebrum. This is divided into the right hemisphere (right side) which controls the left side of the body, and the left hemisphere which controls the right side of the body. Each hemisphere is divided into various sub sections, the main divisions being the frontal lobe, temporal lobe, parietal lobe and occipital lobe. The cerebrum is also where you 'think' and store your memory.

The cerebellum. This lies behind and below the cerebrum. One of its main functions is to help control balance and co-ordination.

The brain stem. This helps to control basic bodily functions such as the heartbeat, breathing, blood pressure, etc. Nerves from the cerebrum also pass through the brain stem to the spinal cord.

The meninges. These are thin layers of tissue which separate the skull from the brain. The outer layer next to the skull is called the dura. The next layer is called the arachnoid. Under the arachnoid tissue is the cerebrospinal fluid (CSF) which bathes the brain and spinal cord.

The pituitary gland. This releases various hormones into the bloodstream.

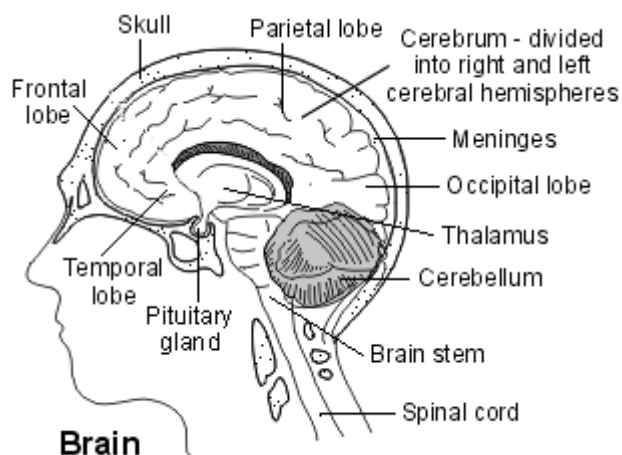
The main type of cell in the brain is called a neurone. There are millions of neurones in the brain. Neurones have long thin nerve fibres which enable them to send messages to other parts of the brain, and down the spinal cord to all parts of the body. The brain also contains cells called glial cells. These provide support, nourishment and protection for neurones. There are various types of glial cells including astrocytes, oligodendrocytes and ependymal cells.

What are tumours and what are brain tumours?

A tumour is a 'lump' or 'growth' of tissue made up from abnormal cells. Tumours are divided into two types - benign and malignant (cancerous).

Benign tumours - general

Benign tumours may form in various parts of the body. Benign tumours grow slowly, and do not spread or invade into other tissues. They are not 'cancerous' and are not usually life-threatening. They often do no harm if they are left alone. However, some benign tumours can cause problems. For example, some grow quite large and may cause local pressure symptoms (especially in the brain), or look unsightly. Also, some benign tumours which arise from cells in hormone glands can make too much hormone which can cause unwanted effects.



Benign brain tumours

Some types of tumours in the brain are benign. The cells of a benign brain tumour do not infiltrate and grow into brain tissue. However, a benign brain tumour can cause symptoms and problems as it gets bigger. This is because it can increase the pressure inside the skull, and press on the delicate brain tissue. Also, some benign pituitary tumours release large amounts of hormones into the bloodstream which can cause various problems. Therefore, unlike many other types of benign tumour, a benign brain tumour often needs treatment to ease symptoms.

Malignant tumours - general

A malignant tumour is a cancerous growth. Cancer is a disease of the cells in the body. There are many different types of cell in the body, and many different types of cancer which arise from different types of cell. What all types of cancer have in common is that the cancer cells are abnormal and multiply 'out of control'. However, there are often great differences between different types of cancer. For example:

- Some grow and spread more quickly than others.
- Some are more easy to treat than others, particularly if diagnosed at an early stage.
- Some respond much better than others to chemotherapy, radiotherapy, or other treatments.
- Some have a better outlook (prognosis) than others. For some types of cancer there is a very good chance of being cured. For some types of cancer, the outlook is poor.

So, cancer is not just one condition. In each case it is important to know exactly what type of cancer has developed, how large it has become, whether it has spread, and how well the particular type of cancer responds to various treatments. This will enable you to get reliable information on treatment options and outlook.

The original site where a tumour first develops is called a primary tumour. Malignant tumours may also spread to other parts of the body to form 'secondary' tumours (metastases). These secondary tumours may then grow, invade and damage nearby tissues, and spread again.

Malignant brain tumours - primary malignant brain tumours

A primary malignant brain tumour is a cancer which arises from a cell within the brain. The cells of the tumour grow into and damage normal brain tissue. Also, like benign brain tumours, they can increase the pressure inside the skull. However, unlike most other types of malignant tumours, primary brain tumours rarely spread (metastasize) to other parts of the body.

There are various types of primary malignant brain tumour. The different types develop from different types of cell in the brain. As a general guide, each type is graded on a scale 1-4. Grade 1 and 2 tumours are said to be 'low grade' and grade 3 and 4 'high grade'. The higher the grade, the more 'aggressive' the tumour tends to be and the faster it tends to grow. The treatment options and outlook (prognosis) can vary depending on the type and grade of the tumour.

Malignant brain tumours - secondary malignant brain tumours

A secondary malignant brain tumour means that a cancer which started in another part of the body has spread to the brain. Many types of cancer can spread ('metastasise') to the brain. The most common are cancers of the breast, lung, colon, kidney, and melanoma of the skin.

More on the different types of brain tumour

There are many types of benign brain tumour and primary malignant brain tumour. Many are very rare. The following is a brief description of the main types.

Meningioma

Meningioma's are usually benign. They arise from cells in the meninges (the tissues that surround the brain).

Medulloblastoma

These arise in the cerebellum and are always high grade malignant tumours. They are uncommon in adults, but are one of the two most common brain tumours in children (the other being an astrocytoma in the cerebellum).

Gliomas

These are malignant primary brain tumours that arise from glial cells. There are various types, depending on the cell of origin. For example:

- Astrocytomas (originating from astrocyte cells.) There are various types of astrocytoma. They include:
 - Low-grade astrocytomas.
 - Anaplastic astrocytoma. This is a high-grade tumour.
 - Glioblastoma multiforme. This is a high grade tumour which tends to grow and spread quite quickly. It is the commonest type of primary malignant brain tumour in adults.
- Oligodendrogliomas (originating from oligodendrocytes). These can vary in their grade.
- Ependymoma (originating from ependymal cells). These are rare, but are usually low grade.

Primitive neuroectodermal tumours (PNETs)

These are very similar to medulloblastomas and mainly occur in children.

Pituitary tumours

There are various types of tumour which arise from the different cells in the pituitary gland. They tend to be benign. However, the cells of the tumour may produce large quantities of hormones which can cause various symptoms. As they grow, they may also cause pressure symptoms. The optic nerves (the nerves of sight) are near to the pituitary and so a growing pituitary gland tumour may press on an optic nerve and affect vision.

Acoustic neuroma (schwannoma)

This is a benign tumour which arises from schwann cells which cover the nerve that goes to the ear. Symptoms can include deafness on the affected side, and vertigo.

Other

There are various other rare types of benign and primary malignant brain tumours.

What causes brain tumours?

The cause of most benign brain tumours and primary malignant brain tumours is not known. Genetic factors may be a 'risk factor' in some cases - perhaps in about 5% of cases. For example, people with the hereditary diseases called neurofibromatosis type 1, Turcot syndrome, Li-Fraumeni cancer syndrome, and tuberous sclerosis have a higher than average risk of developing a glioma. In most of these cases, the glioma occurs in childhood or early adult life and do not account for most cases of glioma. Most cases of glioma occur in older adults where genetic factors are not thought to be involved.

Radiotherapy to the brain is thought to increase the risk of a brain tumour. But again, this would only account for a small minority of cases.

Secondary ('metastatic') brain tumours arise from various cancers of the body. These have various causes. See the separate leaflets about these other cancers.

How common are brain tumours?

Benign brain tumours and malignant primary brain tumours are uncommon. Overall, one occurs in about 14 in 100,000 people each year. The most common types in adults are benign meningioma and a glioma called glioblastoma multiforme. Some types are very rare. Brain tumours can occur at any age. Some types (such as medulloblastoma) are more common in children, and some are more common in adults. Generally, the tumours that tend to occur in adults become more common with increasing age.

Secondary ('metastatic') brain tumours are more common than benign brain tumours and malignant primary brain tumours.

What are the symptoms of a brain tumour?

General symptoms

Common early symptoms are headaches and feeling sick. These are due to increased pressure within the skull (raised intracranial pressure). These symptoms may come and go at first, and tend to be worse in the morning. Coughing, sneezing and stooping may make the headaches worse. Epileptic seizures (convulsions) sometimes occur. But note: most people who have epilepsy do not have a brain tumour. Increasing drowsiness may occur as the tumour enlarges.

Symptoms due to the location in the brain

As a tumour grows it can damage the nearby brain tissue. The functions of the different parts of the body are controlled by different parts of the brain. Therefore, the symptoms vary from case to case depending on which part of the brain is affected, and on the size of the affected area. For example, one or more of the following may develop. These symptoms tend to develop gradually.

- Weakness of muscles in an arm, leg, part of the face, or eyes.
- Problems with balance, co-ordination, vision, hearing, speech, communication, or swallowing.
- Loss of smell.
- Dizziness or unsteadiness.
- Numbness in a part of the body.
- Confusion.
- Personality changes.
- Symptoms related to hormone changes if you have a pituitary tumour.

How are brain tumours diagnosed and assessed?

A doctor will examine you if a brain tumour is suspected from the symptoms. This will include checking on the functions of the brain and nerves (movements, reflexes, vision, etc).

An MRI scan or CT scan of the head are the common tests done to confirm or rule out the presence of a brain tumour. (See separate leaflets called '*MRI Scan*' and '*CT scan*'). If a tumour is identified, further more detailed scans and tests may be done. For example, a PET scan or an angiogram are sometimes done to get more information about the tumour.

A biopsy may be needed to be sure of the type of tumour. A biopsy is when a small sample of tissue is removed from a part of the body. The sample is then examined under the microscope to look for abnormal cells. To obtain a biopsy from a brain tumour you need to have a small operation usually done under anaesthetic. A small hole is bored in the skull to allow a fine needle through to obtain a small sample of tissue. By examining the cells obtained by the biopsy, the exact type of tumour can be identified, and if it is malignant, to determine what grade it is (see above).

Blood tests and other tests on other parts of the body may be done if the tumour is thought to be a secondary tumour. For example, it is quite common for a lung cancer to spread to the brain. Therefore, a chest x-ray may be done if this is suspected. Various hormone tests may be done if a pituitary tumour is suspected.

What are the treatments for brain tumours?

The main treatments used for brain tumours are surgery, chemotherapy, radiotherapy, and medication to control symptoms such as seizures. The treatment or combination of treatments advised in each case depends on various factors. For example, the type of brain tumour, the grade of the tumour if it is malignant, the exact site of the tumour, and your general health.

Surgery

Surgery is often the main treatment for benign brain tumours and primary malignant tumours. The aim of surgery is to remove the tumour whilst doing as little damage to the normal brain tissue. Your specialist will advise on whether surgery is a possible option.

Radiotherapy

Radiotherapy is a treatment which uses high energy beams of radiation which are focused on cancerous tissue. This kills cancer cells, or stops cancer cells from multiplying. (See separate leaflet on *Radiotherapy* for more details.) Radiotherapy is sometimes used instead of surgery when an operation is not possible for a malignant brain tumour. Sometimes it is used in addition to surgery if it is not possible to remove all the tumour with surgery, or to kill cancerous cells which may be left behind following surgery.

Chemotherapy

Chemotherapy is a treatment which uses anti-cancer drugs to kill cancer cells, or to stop them from multiplying. (See separate leaflet on *Chemotherapy* for more details.) It may be used in addition to other treatments such as surgery or radiotherapy, again, depending on various factors such as the type of tumour.

Medication to control symptoms

If you have seizures caused by the tumour then anticonvulsant medication will usually control the seizures. Painkillers may be needed to ease headache. Steroid medication is also commonly used to reduce inflammation around a brain tumour. This reduces the pressure inside the skull which helps to ease headaches and other 'pressure' symptoms.

You should have a full discussion with a specialist who knows your case. They will be able to give the pros and cons, likely success rate, possible side-effects, and other details about the possible treatment options for your type of brain tumour.

You should also discuss with your specialist the aims of treatment. For example:

- In some cases, treatment aims for a cure. If a benign tumour can be removed by surgery then a cure is likely. The chance of a cure for malignant tumours varies, depending on the type of tumour, grade, and other factors such as the location in the brain. (Note: when dealing with malignant tumours, doctors tend to use the word 'remission' rather than the word 'cured'. Remission means there is no evidence of cancer following treatment. If you are 'in remission', you may be cured. However, in some cases a cancer returns months or years later. This is why doctors are sometimes reluctant to use the word cured.)
- In some cases, treatment aims to control the cancer. If a cure is not realistic, with treatment it may be possible to limit the growth or spread of the cancer so that it progresses less rapidly. This may keep you free of symptoms for some time.
- In some cases, treatment aims to ease symptoms ('palliative treatment'). For example, if a cancer is advanced then you may require painkillers or other treatments to help keep you free of pain or other symptoms. Some treatments may be used to reduce the size of a cancer which may ease symptoms such as pain.

What is the prognosis (outlook)?

It is difficult to give an overall outlook. Every case is different. For example, if you have a benign meningioma which is in a suitable place for surgery, the outlook is excellent. For primary malignant brain tumours, the outlook is variable, depending on the type, grade, and location in the brain. The outlook is usually poor if you have a secondary malignant brain tumour.

The treatment of cancer is a developing area of medicine. New treatments continue to be developed and the information on outlook above is very general. The specialist who knows your case can give more accurate information about your particular outlook, and how well your type and stage of cancer is likely to respond to treatment.

Further help and information

Cancerbackup

3 Bath Place, Rivington Street, London, EC2A 3JR

Tel: 0808 800 1234 Web: www.cancerbackup.org.uk

Provides information and support to anyone affected by cancer.

Cancer Research UK

Web: www.cancerhelp.org.uk provides facts about cancer including treatment choices.

Brain Tumour UK

PO Box 27108, Edinburgh, EH10 7WS

Tel: 0845 450 0386 Web: www.braintumouruk.org.uk

Brain Tumour Action

25 Ann Street, Edinburgh, EH4 1PL

Tel: 0131-466-3116 Web: www.braintumouraction.org.uk

British Brain Tumour Association

2 Oakfield Road, Hightown, Merseyside, L38 9GQ

Tel: 0151 929 3229

British Acoustic Neuroma Association (BANA)

Ransom Wood Business Park, Southwell Road West, Mansfield, Notts, NG21 0HJ

Tel: 01623 632143 Web: www.bana-uk.com

Pituitary Foundation

P O Box 1944, Bristol, BS99 2UB

Tel: 0845 450 0375 Web: www.pituitary.org.uk

References

- [Huff JS](#); Neoplasms, Brain. eMedicine. September 2007.
- [Brain tumour - suspected](#), Clinical Knowledge Summaries (2004)
- [Service guidance for improving outcomes for people with brain and other central nervous system tumours](#), NICE (2006)

Comprehensive patient resources are available at www.patient.co.uk

Disclaimer: This article is for information only and should not be used for the diagnosis or treatment of medical conditions. EMIS and PiP have used all reasonable care in compiling the information but make no warranty as to its accuracy. Consult a doctor or other health care professional for diagnosis and treatment of medical conditions. For details see our [conditions](#).
© EMIS and PiP 2008 Updated: 25 Jul 2008 DocID: 4863 Version: 38