

What is a brain tumour?

Our bodies are made up of billions of cells. Normally, these cells reproduce and repair themselves in a controlled way and do not cause us any problems. If for some reason this process gets disrupted, the cells can begin to grow in an uncontrolled way, creating a lump of cells called a tumour.

There are over 100 different types of brain (and spinal) tumour. Brain and spinal tumours are Central Nervous System (CNS) tumours. They are usually named after the type of cell they start from and/or their location in the brain.

This fact sheet gives a brief outline of some of the most common types of brain tumour. If you have been diagnosed with a type of brain tumour not covered in this fact sheet, please contact our Support and Information team.

In this fact sheet:

- What is a brain tumour?
- How brain tumours are graded
- An outline of some of the most common types of brain tumour
- What causes brain tumours
- An outline of how are brain tumours treated

What is a brain tumour?

A brain or other CNS tumour is an abnormal growth caused by cells dividing in an uncontrolled way. There are over 100 different types of brain and spinal tumour and they are usually named according to the types of cell they start to grow from and/or the part of the brain they grow in. A [primary brain tumour](#) begins somewhere in the brain - it has not spread from elsewhere in the body. A [secondary brain tumour](#) (known as a metastasis) has begun somewhere else in the body (for example, the kidney or skin) and has spread to the brain.

Brain tumours are now generally referred to by health professionals according to their 'grade', rather than the terms you may have heard before - 'benign' and 'malignant'. This is because brain tumours may change grade over time.

Grading

Brain tumours are graded 1-4 according to their behaviour, such as the speed at which they are growing.

Grade 1 and 2 tumours are low grade, slow growing, relatively contained and unlikely to spread to other parts of the brain. There is also less chance of them returning if they can be completely removed.

They are sometimes still referred to as 'benign'. The term 'benign' is less used nowadays as it is not thought to be helpful in describing the tumour. These low grade brain tumours can still be serious. This is because the tumour can cause harm by pressing on and damaging nearby areas of the brain, due to the limited space capacity of the skull. They can also block the flow of the cerebrospinal fluid (CSF) that nourishes and protects the brain, causing a build-up of pressure on the brain.

Grade 3 and 4 tumours are high grade, fast growing and can be referred to as 'malignant' or 'cancerous' growths. They are more likely to spread to other parts of the brain (and rarely the spinal cord) and may come back, even if intensively treated. They cannot usually be treated by surgery alone, but often require other treatments, such as radiotherapy and/or chemotherapy.

Some tumours contain a mixture of cells with different grades. The tumour is graded according to the highest grade of cell it contains, even if the majority of it is low grade.

How common is a brain tumour?

Each year in the UK, approximately 4,300 people are diagnosed with low grade, slow growing brain tumours and 5,000 with high grade, fast growing brain tumours.

Combined, this represents fewer than 2 out of every 10,000 people in the UK.

Types of brain tumour

There are many different types of brain tumour and their names can sound long and complicated. As a general rule though, tumours are named according to the type of cell they start from and/or where in the brain they are located.

This fact sheet outlines some of the most common types. The following is not an exhaustive list. If you would like information on any other type, please contact us.

By cell type

Glioma

A glioma is a tumour of the glial cells. Gliomas are the most common type of brain tumour.

Throughout the brain and spinal cord we all have nerve cells called 'neurons', which transmit 'messages' (electrical and chemical signals). Surrounding our neurons are cells called glial cells. Glial cells provide our neurons with oxygen and nutrients and remove dead cells, supporting and protecting the neurons. Glial cells are much smaller than neurons and we have many more glial cells than neurons.

There are different types of glial cells - the main types being astrocytes, oligodendrocytes and ependymal cells. As a result, gliomas can also be divided into different types.

Types of glioma include:

- **Astrocytomas** (arising from astrocytes)
- **Oligodendroglioma** (arising from oligodendrocytes)
- **Ependymomas** (arising from ependymal cells)

You may therefore, for example, hear a tumour referred to as an 'astrocytoma' or a 'glioma' (with astrocytoma being a more specific description of the tumour).

Astrocytoma

Astrocytomas are the most common type of glioma in adults (and children), accounting for 34% of all brain tumours. An astrocytoma can be low grade or high grade. High grade astrocytomas - 'anaplastic astrocytomas' (grade 3) and 'glioblastomas' (grade 4) - are the most common type of brain tumours in adults. **Glioblastoma** is the most 'aggressive', fastest growing type of brain tumour. (You may hear it being referred to as glioblastoma multiforme or GBM, though this term is now used less often).

Oligodendroglioma

This type of glioma develops from the oligodendrocytes, which produce a fatty, protective covering (called myelin) of the nerve cells in the brain. This helps nerve signals travel along the nerves more quickly.

Oligodendrogliomas can be slow growing with well-defined edges (i.e. grade 2), or they can be faster growing (when they are referred to as 'anaplastic oligodendroglioma' or sometimes 'grade 3 anaplastic oligodendroglioma'). They occur most often in the temporal or frontal lobes. (*See The human brain fact sheet.*)

They account for around 3% of all brain tumours and are most likely to be diagnosed in adults.

Ependymoma

This type of tumour develops from ependymal cells, which repair any damage to nerve tissue. Ependymal cells are found in the fluid-filled areas of the brain.

Ependymomas can be high grade or low grade, but the appearance of their cells under the microscope (which is how the grading is established) does not always fit with their behaviour. So the grade may not tell you how likely it is to grow or spread.

They are less common - about 2% of all brain tumours. They occur more often in young adults (and children), where they can occur in any part of the brain. In older adults they usually occur in the lower part of the spinal cord.

As the ependymal cells are in fluid-filled areas of the brain, a tumour of these cells can spread within the central nervous system (brain and spinal cord) via the fluid, although this is not common.

Unspecified glioma

It is also possible to have what is known as a 'mixed' or 'unspecified glioma'. This is a tumour where the doctor cannot tell what type of cell they are, or where the tumour contains more than one type of glial cell (astrocytes, ependymal cells and oligodendrocytes). You will be given treatment for the highest grade of cell type within the tumour.

These types of glioma together account for around 6% of brain tumours.

Vestibular Schwannomas

A schwannoma develops from the Schwann cells that cover the nerves and form the nerve sheath. They can occur on any nerve in the body, but are commonly found on the nerve that controls hearing and balance and which runs from the ear to the brain. These tumours are called a 'Vestibular Schwannoma' or 'Acoustic Neuroma'. Loss of hearing in one ear is a common symptom of a Vestibular Schwannoma.

Schwannomas are found most often in older people. They tend to be slow growing, low grade tumours and do not generally spread from the site that they begin to grow from. Rarely, they are associated with a genetic condition called neurofibromatosis type 2 (NF2) in which case they are usually diagnosed in much younger people.

CNS PNET

Central Nervous System Primitive Neuro-Ectodermal Tumours (otherwise known as CNS PNET) occur in the brain or the spine. They are more common in children and young adults, accounting for around 3-5% of childhood brain tumours.

PNET tumours develop from cells that are left over from the earliest stages of our development, while we are still growing in our mother's womb as an embryo. The 'neuroectoderm' is the part of the embryo that goes on to develop into the brain and spinal cord, but some cells do not develop and specialise the way other cells do and so they appear "primitive". Normally they are

harmless, but they can develop into tumours on rare occasions. Medulloblastoma is a type of PNET.

Medulloblastoma

Medulloblastomas originate from poorly developed brain cells. The majority of them start in the cerebellum (a structure towards the back of the brain that controls balance and co-ordination). Medulloblastomas are high grade and fast growing and can spread to other parts of the brain through the cerebrospinal fluid (CSF). They are the second most common brain tumour in children and the most common high grade tumour in children. They are also diagnosed in young adults.

Haemangioblastomas

Haemangioblastomas are tumours that grow from blood vessel cells. They are low grade, very slow growing and do not spread, but they can grow in the brain stem and then they are very difficult to treat. They represent about 2% of brain tumours.

People/families with a genetic condition called Von Hippel-Lindau Syndrome inherit a pre-disposition (proneness) to developing multiple haemangioblastomas in the cerebellum, brain stem or spinal cord (as well as other areas, such as the kidneys).

Germ cell tumours

These grow from germ cells that form part of the embryo and develop into the reproductive system. Most occur outside the brain, but those that do grow in the brain are most often in the area close to the pituitary gland and the pineal gland at the base of the brain. They are also called embryonal tumours.

They represent around 1 - 2% of all brain tumours. About half of these occur in children and young adults (10 - 20 years old).

These tumours are often in the middle of the brain and can block the flow of fluid (CSF) around the brain and spinal cord. This causes headaches and sickness and as a result these tumours are often picked up early when they are still small. They also sometimes produce chemicals that can be picked up on blood tests (markers) and this can also help to diagnose these tumours quickly.

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By location in the brain

Meningioma

A meningioma is a type of brain tumour that begins in the meninges. The meninges are a set of membranes that cover and protect the brain and spinal cord. They occur most often in the membranes covering the cerebrum or cerebellum (*See The human brain fact sheet.*)

About one quarter (25%) of brain tumours in adults are meningiomas. They are more common in older adults and in women.

The majority of meningiomas are low grade. However, some do not behave as expected and can be more aggressive, spreading into surrounding tissue or growing back after they have been removed.

Pituitary adenoma

A pituitary adenoma is a tumour that develops from the tissue of the pituitary gland. The pituitary is a gland that is found towards the base of the brain. It controls other glands within the body that in turn control many of the body's functions.

About 8% of tumours are in the pituitary gland. They are more common in older people and tend to be low grade, slow growing tumours that rarely spread.

Some pituitary adenomas can cause unusual effects by producing too much of one of the pituitary hormones. Treatment will partly depend on whether your pituitary adenoma produces hormones or not.

CNS lymphoma

A lymphoma is a tumour caused by the uncontrolled growth of the lymph cells (a type of white blood cell). Lymph cells help the body fight infection. There are many different types of lymphoma - usually they form in the lymph nodes around the body.

Rarely, a lymphoma can form in other places, such as the CNS (central nervous system, which consists of the brain and spinal cord) - either as a mass that presses on the brain or spinal cord

from outside or, less commonly, as a mass or spread within the meninges (the membranes covering the brain). These lymphomas are called a primary cerebral lymphoma or a primary CNS lymphoma.

They are usually high grade and are a type of 'non-Hodgkin lymphoma' called diffuse large B cell non Hodgkin lymphoma. (Hodgkin lymphoma is a different illness entirely). It is important for your doctors to tell you which type of lymphoma you have.

CNS lymphomas represent just under 5% of brain and spinal cord tumours. They are usually treated differently to other brain tumours.

What causes brain tumours?

Very often, the answer is that we just do not know. This can be one of the most difficult things to accept and can leave you feeling helpless and frustrated. **Brain tumours are nobody's fault.**

There has been much in the news about the possibility of mobile phones and power lines causing brain tumours, but research remains inconclusive and, at present, there is no clear link between exposure to mobile phones or power lines and brain tumours.

The risk factors that we know about

Genetics

According to Cancer Research UK, genetics (inheriting a gene or genes that make you more likely to get a brain tumour) are thought to account for around 5% of brain tumours. The following factors may affect your risk of developing a brain tumour:

- If an immediate family member (parent or sibling) has a tumour of the CNS you may have a slightly higher chance of developing a brain tumour, although the risk is still very low.
- If you have one of the following genetic conditions your risk of developing a brain tumour is increased:
 - ◇ neuro-fibromatosis (NF) types 1 or 2
 - ◇ Li Fraumeni syndrome
 - ◇ Von Hippel-Lindau syndrome
 - ◇ Turner syndrome

Radiation

We know that radiation does increase the risk of a brain tumour developing. The risk of developing a meningioma or glioma is higher if you had radiotherapy to the head as a child particularly before the age of five. Due to the known risk of learning difficulties, health professionals try to avoid giving radiation to a young child's brain. Radiotherapy is not given without very careful consideration and you would not have been given radiotherapy unless the expected benefits outweighed any potential risks to you.

Brain tumours can be difficult to spot as their symptoms can be very similar at first to many common ailments. (*See Symptoms of a brain tumour in adults factsheet; for young adults and children, see our HeadSmart website www.headsmart.org.uk*)

How are brain tumours treated?

Several factors influence the decision as to which treatment will best help you. A team of specialised health professionals will consider your individual diagnosis and take account of factors, such as the size and location of the tumour, the type of tumour you have and how quickly it is growing. They will also consider your age and general health.

Surgery will often be used to remove as much of the tumour as possible. This will help to reduce pressure on the brain caused by the impaired flow and accumulation of the CSF, the tumour itself or by the brain's reaction to its growth (cerebral oedema). It is increased pressure that can cause some of the symptoms.

However, depending on where in the brain the tumour is, surgery is not always possible or necessary. Sometimes, it would be too risky to operate as the tumour may be very close to, or wrapped around, an important part of the brain, such as the brain stem, and the benefits of surgery would be outweighed by the dangers. In other cases, such as with very slow growing, low grade brain tumours, problems with increased pressure may not develop, so you may not need surgery straight away or not even at all. (*For more information, see our Neurosurgery and Watch and wait fact sheets.*)

Other treatments, such as **radiotherapy** and **chemotherapy** may be used - on their own, in combination or after surgery to try to

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remove any remaining tumour cells. Forms of radiotherapy are also considered if a person has many tumours, such as in Von Hippel-Landau Syndrome, described earlier in this fact sheet. *(For more information, including information about duration of treatment, please see our Radiotherapy and Chemotherapy fact sheets).*

A further type of treatment, that a few people may be able to have, is **Proton Beam Therapy** (PBT). PBT is a type of radiotherapy that uses a beam of positively charged subatomic particles (protons) to target the tumour in a very precise way, reducing the harm to healthy tissue. However, PBT is only suitable for a few types of brain tumour - it works best for smaller tumours and those where the margins are clearly defined. There is also some debate about whether it is any better than conventional well-targeted radiotherapy. It is not currently available in the UK for use in brain tumours, though it can be received outside the UK through the NHS **where appropriate and in certain circumstances.**

The Department of Health has announced two Trusts in England that have been chosen to develop PBT centres - The Christie NHS Foundation Trust Hospital in Manchester and University College London Hospitals NHS Foundation Trust. Given the complex nature of the treatment and facilities, PBT won't be fully available in England until 2018. Until then, the NHS will continue to fund patients to receive treatment abroad.

It is important to note that there are specific referral criteria for PBT and if you do not meet this criteria you will not be referred on the NHS. *(For further information, see the Proton Beam Therapy fact sheet).*

It is important to know that your medical team will tailor your treatment to provide the treatment that is the best for you. This could mean that you meet other patients who have the same tumour but who are receiving different treatments. The reasons for this could be due to several factors. If you are worried or concerned at all, you should speak to your medical team who will be able to help you understand the treatment decisions that have been made. If you feel you are not getting the correct treatment you can ask for a second opinion. More information about this can be found on the NHS Choices website www.nhs.uk/chq/Pages/910.aspx

What effects can I expect to experience from a brain tumour?

Some of the effects you experience will be a result of the brain tumour itself, whilst others will be due to the treatment you receive. *(For more information, see the following fact sheets: Symptoms of a brain tumour in adults; Neurosurgery; Chemotherapy; Radiotherapy; and Steroids)*

What if I have further questions?

If you require further information, any clarification of information, or wish to discuss any concerns, please contact our Support and Information Team:

Call: 0808 800 0004

(free from landlines and most mobiles:
3, O2, Orange, T-mobile, EE, Virgin and Vodafone)

Email: support@thebraintumourcharity.org

Join our online forums at:
thebraintumourcharity.org/forums

About us

The Brain Tumour Charity makes every effort to ensure that we provide accurate, up-to-date and unbiased facts about brain tumours. We hope that these will add to the medical advice you have already been given. Please do continue to talk to your doctor if you are worried about any medical issues.

We are the UK's pre-eminent brain tumour charity. We fund scientific and clinical research into brain tumours and offer information and support to those affected, whilst raising awareness and influencing policy.

We rely 100% on charitable donations to fund our vital work. If you would like to make a donation, or want to find out about other ways to support us including fundraising, leaving a gift in your will or giving in memory, please visit us at thebraintumourcharity.org, call us on **01252 749043** or email fundraising@thebraintumourcharity.org

About this fact sheet

This fact sheet has been written and edited by The Brain Tumour Charity's Support and Information Team. The accuracy of medical information has been verified by a leading neuro-oncologist. Our fact sheets have been produced with the assistance of patient and carer representatives and up-to-date, reliable sources of evidence. If you would like a list of references for any of the fact sheets, or would like more information about how we produce them, please contact us.



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Your notes

**Saving lives through research,
information, awareness & policy**



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