BRAIN TUMOR TREATMENT GUIDE

A brain tumor forms when cells in the brain change and grow out of control. As they continue to grow, they form a mass of cells that becomes a tumor.

We understand that a brain tumor diagnosis can be stressful and full of unknowns. Vanderbilt Health developed this guide to answer common questions about brain tumors. We hope this guide provides you with helpful information about the different conditions we treat and the types of treatment you can expect.

Please keep in mind that treatment plans can differ. If you have specific questions about your care after reading this, please discuss them with your doctor. We provide you with the best care possible for your diagnosis.

About Brain Tumors

Brain tumors are classified two ways:

- **Primary:** Primary brain tumors originate in the brain, from abnormal brain tissue or the areas surrounding the brain. A primary brain tumor can be cancer (malignant) or not cancer (benign). Benign tumors grow slowly and can cause damage by pressing on other parts of the brain. Malignant tumors, on the other hand, grow rapidly and spread cancerous cells to other parts of the brain.
- **Secondary (metastatic):** Secondary brain tumors are cancerous tumors that begin in another part of the body and spread to the brain. Metastatic cancer uses the same name as the cancer from which it originated — for example, breast cancer that spreads to the brain is called metastatic breast cancer, not brain cancer. Metastatic brain tumors are roughly ten times more common than primary brain tumors.

With a brain tumor, the first step you take is critical. Our expert team works together to provide a precise diagnosis — or second opinion consultation — with the most effective treatment options available. We combine advanced research and techniques with compassionate care to create a personalized treatment plan that meets your unique needs.

Types of Brain Tumors

There are more than 100 types of brain tumors. The most common brain tumors in adults include:

Glioma

Gliomas are the most common primary brain tumors. Glioma is a term used for a family of tumors that start in the glial cells in the brain. Gliomas are usually found in the upper part of the brain, often referred to as the cerebrum. They can also start in the brain stem, optic nerve or cerebellum. Gliomas are usually cancerous, but sometimes can be benign.

Common gliomas include:

- **Astrocytoma:** This is the most common type of malignant brain tumor. These tumors can grow anywhere in the brain but are usually found in the cerebrum.
- **Glioblastoma (GBM):** The fastest growing and most aggressive astrocytoma is called glioblastoma. GBMs account for 52% of all primary brain tumors. They can be found anywhere in the brain and invade nearby brain tissue.
- **Ependymoma:** This rare tumor starts in the lining around the fluid-filled areas of the brain. It is most often found in young children and young adults and may or may not be cancerous. Ependymomas can also occur in the spinal cord.
- **Oligodendroglioma:** These brain tumors form in the cells of the brain or spinal cord that produce the substance that protects nerve cells. These tumors are often slower growing and respond better to treatment.

Acoustic Neuroma

An acoustic neuroma, also called a vestibular schwannoma, is a benign tumor that grows slowly on the nerves that connect the ear to the brain. Acoustic neuromas can be hereditary in a small number of cases.

Meningioma

A meningioma is a tumor that grows in the layers of tissue that cover the brain and spinal cord. Most meningiomas grow very slowly and take time to present symptoms. They are usually benign, but because of their location, can still cause neurological problems if left untreated.

Pituitary Tumor

A pituitary tumor is an abnormal growth in the pituitary, a small gland beneath the brain that makes hormones that affect many functions of the body. Most pituitary tumors are benign. However, they can make too many hormones that will often cause a dysfunction of other glands (adrenal, thyroid, etc.) This can cause additional problems in the body. Pituitary tumors can also cause vision changes because of their location near the optic nerves.

Skull Base Tumors

Vanderbilt Health offers expert treatment for other skull base tumors to help preserve your speech, hearing, smell and eyesight. This includes chordomas, craniopharyngiomas, glomus tumors, and other common and rare skull base tumor types.

Grading Brain Tumors

The World Health Organization (WHO) developed a grading system for brain tumors. It uses a scale of 1 to 4 (using the Roman numerals I, II, III and IV), with 4 being the most serious. This system helps healthcare providers decide how to best treat a tumor.

A tumor's grade is determined by how different tumor cells look from normal cells under a microscope:

- **Grade I:** These tumors are called low-grade and look most like normal cells. They are slow-growing and do not spread into nearby tissue. They may be considered benign, can often be cured with surgery and rarely come back.
- **Grade II:** Like Grade I, these tumors grow slowly but can spread into nearby brain tissue. They are more likely to come back after treatment than Grade I tumors and more likely to start growing faster over time. Along with surgery, they may need other treatments, such as chemotherapy and radiation.
- **Grade III:** These tumors are considered high-grade and tend to spread into nearby parts of the brain. Along with surgery, they may need other treatments, such as chemotherapy and radiation.
- **Grade IV:** These tumors look the most abnormal under the microscope and are considered cancerous. They grow and spread most rapidly. They are least likely to be cured.

Symptoms of Brain Tumors

Brain tumor symptoms largely depend on the type of tumor you have as well as its location. If the tumor grows slowly, symptoms may appear over time. This can make them difficult to notice.

The most common symptoms of a brain tumor include:

- **Headache:** Headaches are the most common complaint, affecting nearly half of people with brain tumors. These headaches can be worse in the morning, wake you up in the middle of the night and get worse when you exercise, cough or change position.
- **Seizure:** A seizure is often the first sign of a brain tumor. The tumor will push on nerve cells in the brain, resulting in the seizure. Seizures can range from halting speech to muscle twitches and spasms to loss of consciousness.
- **Nausea:** Tumors can cause nausea or vomiting because of the pressure they place on different structures in the brain.
- **Weakness or numbness:** Some brain tumors can cause numbness in the face, arms, legs or both. It may occur on only one side of the body if the tumor is in a certain part of the brain.
- **Fatigue:** More than just feeling tired, fatigue is when you are completely exhausted all or most of the time. You might also feel weak overall, have lost your ability to focus or fall asleep in the middle of the day.
- **Memory or personality change:** Memory problems can be from a tumor in the frontal or temporal lobe. You may find it hard to concentrate, you are often confused by simple matters or you have short-term memory issues.

You may also experience changes in hearing, vision, speech as well as difficulties walking or talking. Consult your physician if your symptoms get worse or interfere with everyday life.

Diagnosing Brain Tumors

If your healthcare provider suspects a brain tumor, you will need exams and imaging scans to know for sure.

Tests include:

- MRI
- Magnetic resonance spectroscopy (MRS)
- Magnetic resonance angiography (MRA) and magnetic resonance venography (MRV)
- Diffusion tensor imaging (DTI)
- Functional MRI (fMRI)
- CT scan or CT angiogram (CTA)
- Positron emission tomography (PET) scan
- Angiogram

Other tests may be done, too, such as:

- Lumbar puncture (spinal tap)
- Electroencephalogram (EEG)
- Vision and hearing tests
- Brain tumor biopsy

Your doctor will review your imaging and biopsy results and develop a tailored approach to your treatment, including any additional testing you may need.

Treatment Options

A brain tumor diagnosis does not always mean surgery. Your treatment depends on many factors, including the type, size and location of the brain tumor. We offer a wide range of treatment options for both benign and malignant tumors, including:

Medicine

Steroids

Steroids reduce swelling around the tumor. This helps relieve headaches and ease other symptoms. Always take steroids as directed and do not stop taking them without your healthcare provider's approval. If you have been taking steroids for more than a few days, you will need to stop taking them slowly over time.

Anticonvulsants

If you have had seizures, you may be given anticonvulsants to help prevent seizures and convulsions. Always take them as directed. Do not discontinue this medication without discussing with your doctor.

Other medicines

These medicines can help treat side effects caused by brain tumors or cancer treatments and include:

- Antiemetics to help control nausea and vomiting
- Pain relievers
- Medicine to help with anxiety, stress or depression
- Hormones to replace the ones your body is not making because of treatment or certain types of tumors

Talk with your healthcare provider about the possible side effects of the medicine you are given.

Surgery

Surgery is a common treatment for brain tumors. It may be done to try to remove all of the tumor, to help relieve or prevent symptoms or to biopsy the tumor. The type of surgery performed mostly depends on the type, size and location of the tumor. Your age and overall health are also considered

Types of surgery include:

- **Traditional surgery:** In most cases, the neurosurgeon will remove a small piece of the skull (bone flap) to get to the tumor. This is called a "craniotomy." At the end of the surgery, the bone flap will be replaced and held in place with small titanium plates and screws.
- **Laser ablation:** This minimally invasive technique uses the Monteris NeuroBlate System. It targets the tumor through MRI-guided laser energy to remove the affected brain tissue.
- **Endoscopic surgery:** The surgeon will use a minimally invasive approach to remove a tumor through a natural opening, usually the nose. This is the method of treatment for many pituitary tumors.

During surgery, your neurosurgeon will try to take out the whole tumor if possible. If the surgeon can't remove all of the tumor without harming the brain, he or she will take out as much as possible. Reducing the size of a tumor through surgery can help relieve some symptoms. Additional treatment is sometimes given after surgery to lower the risk of the tumor coming back.

Radiation

Radiation therapy uses strong beams of energy to control the growth of some types of brain tumors. It is often used along with surgery or chemotherapy.

Radiation therapy is performed by a radiation oncologist, sometimes alongside a neurosurgeon, and may be used:

- After surgery (sometimes with chemotherapy) to try to kill cancer cells left in the brain
- As the main (primary) treatment if surgery cannot be performed safely
- To help relieve symptoms caused by the tumor

There are many different types of radiation therapy. The radiation oncologist may choose a different technique to be more precise and reduce radiation exposure to healthy brain tissue.

- **Fractionated radiation:** This type of radiation is often done for gliomas and consists of several treatments spread out over several weeks.
- **Stereotactic (Gamma Knife) radiosurgery:** Stereotactic radiosurgery is a minimally invasive option that uses computer-guided, targeted radiation on the tumor with pinpoint accuracy. It is usually done for metastatic tumors.

Chemotherapy and Immunotherapy

Chemotherapy (or chemo) uses strong medicines to kill cancer cells. The medicines attack and kill cells that divide quickly. They tend to work better on fast-growing tumors. It is often used along with other treatments, including surgery or radiation therapy.

Chemotherapy can be given in several ways:

- As pills taken by mouth
- Into the blood through a vein (IV)
- Right into the cerebrospinal fluid (CSF) inside the brain (this is called intrathecal chemotherapy)

Immunotherapy is a newer type of treatment that is considered for many types of brain tumors. Some immunotherapy treatments are standard for some tumors and others are given through clinical trials. Immunotherapy includes many different types of treatments that are given as IV treatments, injections in the skin or delivered to the tumor at the time of surgery. Sometimes immunotherapies are referred to as "vaccines."

Tell your healthcare team about any side effects you experience after beginning treatment; some medicines can help reduce and even prevent them.

Targeted Therapy

Cancer is driven by changes in the DNA cells. Newer medicines work differently from standard chemotherapy medicines by targeting these changes in your cells. We use the mutations in the tumor's DNA to find the right targeted medicine that will be most effective for you. These therapies are typically used when surgery is not an option or the tumor comes back after treatment.

Clinical Trials

Researchers are finding new ways to treat brain tumors which are tested in clinical trials. Participating in a clinical trial can bring many benefits, including accessing new treatments or helping advance science. Before starting treatment, ask your healthcare team if there are any clinical trials you should consider.

Why Choose Brain Tumor Care at Vanderbilt?

We are devoted to delivering the best possible care for your specific brain tumor. Our specialized team has performed more than 10,000 brain surgeries with excellent outcomes. Whether you need access to compassionate care, innovative clinical trials or encouraging support groups, we are here to meet you where you are in your journey.

With Vanderbilt Health, you can expect:

Depth of experience

Our combined team of neurosurgeons and neuro-oncologists is unmatched in Tennessee, consisting of fellowship-trained physicians who practice exclusively in brain tumors and intracranial neurosurgery.

Team-based approach

Professionals from all neurology specialties — neuro-oncology, neurosurgery, neuro-anesthesia, neuropathology and neuro-ICU — combine their expertise to create a personalized care plan that is right for you. We also work with nutritionists, psychiatrists and psychologists to meet all your physical and emotional needs.

Specialized tumor boards

We hold a weekly multidisciplinary brain tumor board conference to receive input on each patient's condition from experts, such as neuropathologists, neuroradiologists and oncologists with specific training in neuro-oncology, radiation oncologists and brain tumor neurosurgeons.

Recognized cancer care

The National Cancer Institute designates us as a Comprehensive Cancer Center, the highest ranking by the world's leading authority on cancer. Vanderbilt-Ingram Cancer Center is the only Cancer Center with this designation in the state of Tennessee that treats both adults and children with cancer.

Innovation in cancer care

As a research-based cancer center, we are at the forefront of the latest treatments for brain tumors, including stereotactic radiosurgery. Our commitment to research means that you receive the most current, sophisticated treatment available.

Patient care coordinators

Our patient care coordinators guide you through your care plan. They can help you schedule appointments, gather medical records, address concerns and coordinate your care among all the specialists involved in your treatment.

Being diagnosed with a brain tumor can be an overwhelming experience. But you are not alone in your healthcare journey. Vanderbilt's highly skilled physicians, nurses and patient care coordinators are with you every step of the way to help you feel better, physically and emotionally, during your treatment and beyond.

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