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# Brain Tumor

## Glioblastoma

### Definitions

**Malignant:**  
Cancerous.

**Primary brain tumor:**  
A tumor that originates in the brain or spinal cord tissue rather than spreading to the brain from another part of the body.

**Pathologist:** A physician who examines tissues and fluids under the microscope to diagnose disease in order to assist in making treatment decisions.

### What is glioblastoma?

Glioblastoma is a type of primary malignant brain tumor. Glioblastoma is also known as GBM, grade 4 (IV) astrocytoma, and glioblastoma multiforme. It is the most frequent primary brain tumor type in adults, comprising about a quarter of all primary brain tumors diagnosed in the United States. Glioblastoma is life threatening. However, advances in care are making longer survivals possible.

### Who is likely to have glioblastoma?

This is the primary brain tumor type that is the most common type of brain tumor in adults between age 45 and 70. Glioblastoma can occur at any age, however, including childhood. This type of cancer is more common in men than women. Glioblastoma diagnosed in people over age 45 tends to be more aggressive and more difficult to treat than glioblastoma in younger people.

### What characterizes glioblastoma?

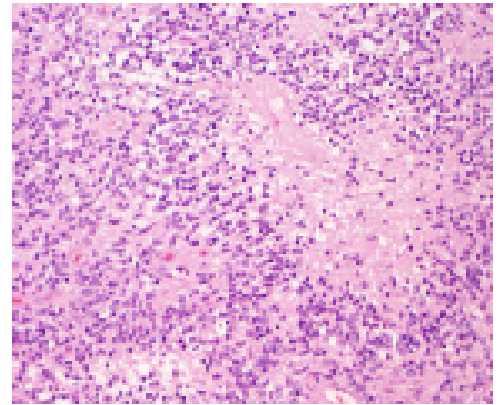
Glioblastoma usually penetrates deep into the brain, making the tumor's entire removal very difficult for surgeons. These tumors also can affect parts of the brain that control speech, vision, or motor functions. For this reason, surgery may come with the risk of disability, depending on exactly which part of the brain is affected. Glioblastoma tends to spread quickly within the brain and nervous system but rarely spreads outside the nervous system.

Symptoms often begin abruptly and depend on the location of the tumor within the brain. Common symptoms include headaches that are worse in the morning and improve during the day, seizures, mental or personality changes, nausea and vomiting, drowsiness, and vision problems.

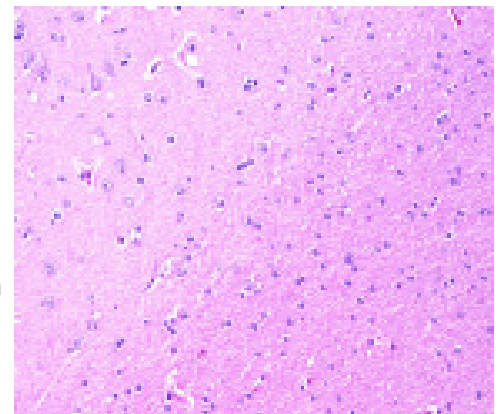
### How does the pathologist make the diagnosis?

If brain tumor symptoms are present, your primary care physician performs a thorough neurological exam to check vision, hearing, balance, coordination, and reflexes. To see inside the brain and locate the problem, the physician will order imaging tests such as **magnetic resonance imaging (MRI)**, **computed tomography (CT)**, or **positron emission tomography (PET)**. A **radiologist** reviews these images and, in many cases, can diagnosis a tumor as malignant or benign using only these images. However, a definitive diagnosis and sub-classification of a primary brain tumor is rendered by a pathologist, based upon the radiographic features and microscopic features of the tissue biopsy/resection material.

It is important that a pathologist experienced in examining brain tumors performs this microscopic review. Studies show that the diagnosis may change substantially for at least one-third of patients when an experienced pathologist does the review. *(continued on next page)*



Glioblastoma shows features of an anaplastic astrocytoma plus areas of tumor necrosis and marked proliferation of blood vessels accompanying the malignant astrocytes.



Normal brain cells.

## What kinds of questions should I ask my doctors?

Ask any question you want. There are no questions you should be reluctant to ask. Here are a few to consider:

- Please describe the type of cancer I have and what treatment options are available.
- What is the grade of the cancer?
- What are the chances for full remission?
- What treatment options do you recommend? Why do you believe these are the best treatments?
- What are the pros and cons of these treatment options?
- What are the side effects?
- Is your medical team experienced in treating the type of cancer I have?
- Can you provide me with information about the physicians and others on the medical team?
- If I want a second opinion, could you provide me with the names of physicians and/or institutions that you would recommend?

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## What is meant by the grade of the cancer?

The **grade** of a tumor refers to how benign or malignant it appears under the microscope and how aggressively the cells are growing. Tumors are graded on a grade I-IV scale, with IV the worst. In a grade I cancer, the cells look close to normal, with only slight abnormal changes. At this stage, the cells are slowly growing and **indolent**. Grade IV cancer cells bear little or no resemblance to normal cells, and the cells are growing quickly and are **frankly malignant**. Grades II and III describe conditions between these two extremes.

## How do doctors determine what treatment will be necessary?

Your treatment will depend on the size, stage, and location of the tumor, as well as your age. The pathologist consults with your **neurosurgeon, radiation oncologist, and oncologist**. Using their combined experience and knowledge, they determine treatment options most appropriate for your condition. It's important to learn as much as you can about your treatment options and make the decision that's right for you.

## What kinds of treatments are available for glioblastoma?

Treating glioblastoma is a complex process, requiring a variety of techniques and procedures. The initial treatment often includes **steroid medications** to reduce swelling and inflammation of brain tissue, as well as **anticonvulsant medications** to prevent and control seizures if you have experienced them. If fluid has built up in the brain, a physician may insert a **shunt**—a long, thin tube that draws excess fluid from the brain.

Common treatments to remove or reduce the size of glioblastoma include a combination of **surgery, radiation therapy, and chemotherapy**. For all operable tumors, surgery followed by radiation therapy and chemotherapy is recommended to improve patients' survival. To make sure that you receive treatment consistent with current best practices, you are encouraged to obtain a second opinion from a brain tumor specialty center for adults or children.

Surgeons work to remove as much of the glioblastoma as possible while trying to minimize damage to healthy tissue. Some tumors can be removed completely while others only partially or not at all. To gain access to the tumor, surgeons may cut bone from the skull in a procedure called **craniotomy** and replace the bone after the procedure. Some surgeons use a high-powered microscope (microsurgery) or computer programs that create 3-D maps of the tumor's location; these maps help surgeons to remove tumors with minimal damage to healthy tissue and can reduce your pain and recovery time. In some situations, ultrasonic waves can be used to break apart the tumor, with the fragments removed by suction, in a procedure called **ultrasonic aspiration**. Sometimes, to prevent cancer from coming back, surgeons place chemotherapy-coated wafers in the space where a tumor has been removed.

Radiation therapy—pinpointed high-energy beams—can shrink tumors or destroy cancer cells remaining after surgery. This treatment is also an option if surgery is not possible. Radiation therapists sometimes use 3-D maps similar to what surgeons use to deliver radiation in the exact size and shape of the tumor.

A common treatment regimen involves seven weeks of targeted radiation treatment combined with a chemotherapy drug called **temozolomide (Temodar®)**, which makes the tumor more sensitive to the radiation therapy.

Because of the difficulty of treating glioblastoma, you should consider enrolling in a **clinical trial** testing new treatments. These treatments are highly experimental in nature but may be an option, especially for advanced cancers. Some trials may involve biologic therapy, which uses the natural defenses of the immune system to fight cancer. Clinical trials for glioblastoma may be found at [www.cancer.gov/clinicaltrials](http://www.cancer.gov/clinicaltrials) or by calling NCI's Cancer Information Service at 800-4-CANCER (800-422-6237) or NCI's Neuro-Oncology Branch at 301-402-6298.

Current clinical trials for glioblastoma evaluate new procedures such as **brachytherapy, stereotactic radiosurgery, and intraoperative radiation therapy**. In brachytherapy, radiation therapists place materials that produce radiation (radioisotopes) directly into the tumor to destroy cancerous cells from the inside. In stereotactic radiosurgery, radiation therapy is used to damage cancer cells, taking away their ability to reproduce. Because the dose of radiation used in this procedure is designed to have minimal effect on normal tissue, this therapy is used to treat tumors that have tentacles reaching into parts of the brain that are difficult to reach. In intraoperative radiation therapy, the surgeon moves vital organs or tissue out of the way so that they will not be harmed by the radiation. In another new treatment being evaluated, radiation therapy is delivered in smaller, more frequent doses to lessen side effects.

**For more information**, go to [www.cancer.gov](http://www.cancer.gov) (National Cancer Institute) or [www.abta.org](http://www.abta.org) (American Brain Tumor Association). Type the keywords **glioblastoma** or **brain tumor** into the search box.