UNDERSTANDING YOUR BRAIN TUMOR DIAGNOSIS

Understand Your Options for Care

To make an appointment, call 216-910-6183.
You’ve had some unusual symptoms lately such as dizziness, headaches or just feeling tired. So you made an appointment with your doctor to find out why. Maybe it’s a touch of the flu or the beginnings of a sinus infection. But, what if your doctor says you might have a brain tumor? What do you do? What do you need to know?

When a brain tumor is suspected, it is important that the diagnosis is confirmed and treated promptly, so you’ll likely need to make a lot of decisions very quickly. Start by reviewing this guide to become familiar with brain tumors, how they are diagnosed and the treatment options available. If you’re feeling overwhelmed and don’t know what to do next, call us. We can help.

At University Hospitals, our nationally recognized experts in neurosurgery, neurology, neuro-oncology, neuro-pathology, otolaryngology, radiology and other specialties work together to create a customized treatment plan for each patient. This multidisciplinary team’s focus on innovation and research ensures that our patients are among the first to receive groundbreaking treatments and therapies.
Brain Tumor Risk Factors

Who is at risk? Why me?
The risk of developing a brain tumor is quite low – in the United States, only about six of every 1,000 people will be affected each year. However, if you’re one of the six, it’s human nature to ask, “Why me?”

No one fully understands what causes a cell to change from its normal pattern and begin to multiply in an abnormal way, but a few risk factors have been established by research. These risk factors apply primarily to malignant (cancerous) brain tumors.

Age
The likelihood of a brain tumor diagnosis increases with age. People over age 65 are diagnosed at a rate four times higher than that of younger people. The median age of diagnosis is 57 – 59.

Environmental toxins
There is some evidence that exposure to environmental toxins may increase the incidence of brain tumor. Those who have worked in the oil refining, rubber manufacturing or drug manufacturing industries may be at higher risk.

Previous radiation therapy
Previous radiation therapy may increase the risk of developing a brain tumor, especially if the radiation was delivered to the head and neck area.

Existing medical conditions
Certain medical conditions that affect the immune system, such as HIV, can lower a person’s resistance and make him or her more susceptible to developing a brain tumor.

Lifestyle
There is no clear connection between lifestyle and brain tumors. However, some research indicates that cell phone use may contribute to certain types of brain tumors. Additionally, obesity and diabetes may contribute to a worse prognosis for those who do suffer from brain tumors.
Primary brain tumors
A primary brain tumor is a growth that begins in the brain. It will usually remain contained within the brain and not spread to other parts of the body. It can be either benign (noncancerous) or malignant (cancerous).

Primary brain tumors are usually named for the type of brain cell in which they first formed. Given that the brain is made up of so many different types of cells, there are over 120 identified types of primary brain tumors. The four most common types are:

Glioma
A tumor that originates in the glial cells of the brain. These cells help keep the nerves in the brain healthy.

Meningioma
A tumor that originates in the meningeal cells of the brain. These cells make up the meninges – a thin layer of tissue that covers the brain and spinal cord.

Schwannoma
A benign tumor, also known as a neuroma, that develops in the protective sheathing surrounding nerve cells. Schwannomas can develop anywhere Schwann cells (which support the function of nerve cells) are present.

Pituitary adenoma
A benign, slow-growing tumor that originates in the pituitary gland, located at the base of the brain. The pituitary gland regulates the body’s hormones.

Benign primary brain tumors
Tumors that originate in the brain but are not cancerous are called benign primary brain tumors. In imaging tests, benign tumors have certain characteristics such as clearly defined borders and are not deeply rooted in surrounding brain tissue. They tend to grow very slowly and can usually be removed surgically if they are located in an accessible area of the brain.

Benign tumors elsewhere in the body are not usually a major health risk, but in the brain, they can damage surrounding cells by causing inflammation and/or by putting pressure on nearby structures. Therefore, even a benign brain tumor will likely require treatment or surgery to shrink or remove the mass.

Malignant primary brain tumors
Tumors that originate in the brain and show signs of being cancerous are called malignant primary brain tumors. Signs that a tumor is malignant include rapid growth and irregular borders as shown on imaging exams. Malignant tumors send out roots to invade surrounding brain tissue, which is why their borders are not well-defined. They can spread by shedding cells that travel to other parts of the brain and spinal cord via the cerebrospinal fluid. They rarely spread outside the brain.

Malignant primary brain tumors can be life-threatening, and aggressive treatments will likely be recommended.
Metastatic brain tumors
Metastatic brain tumors are the most common type of brain tumor. They do not originate in the brain but rather are made of cells that have broken off from cancers elsewhere in the body and traveled to the brain, where they invade the tissue and begin to multiply. All metastatic tumors are cancerous.

The most common types of cancer that metastasize (travel) to the brain are lung, skin, breast, colon, kidney, and head and neck cancers. More than 50 percent of metastatic brain cancers originate in the lungs.

Treatment and survival rates are determined by the origin of the cancer cells and by where in the brain the tumor is located. Aggressive therapies will almost always be recommended.
Symptoms and Diagnosis

Symptoms are not the most reliable tool for a brain tumor diagnosis because they can vary greatly based on the size and location of the mass. Some brain tumors may not cause any symptoms in the early stages; some may cause a very gradual development of symptoms; and some may not cause symptoms until they are very large and serious, causing a rapid decline in health.

However, symptoms are important in that they prompt you to go to the doctor for evaluation – often brain tumors are discovered “accidentally” while doctors are investigating potential causes for complaints such as:

- Headache that doesn’t respond to usual remedies
- Loss of appetite
- Memory issues
- Weakness in one part of the body
- Changes in speech, hearing or vision
- Balance problems
- Numbness or tingling in arms and legs
- Inability to concentrate

Many of these problems can be caused by other medical conditions, so your doctor will most likely investigate to rule out other possible causes before suspecting a brain tumor. He or she will take a complete personal and family health history and conduct a physical exam as well as a neurological exam to gain more information about your condition and possible causes of your symptoms.

If your doctor suspects a brain tumor, he or she will usually order a computed tomography (CT) scan with contrast as the first diagnostic test. The contrast is created by a dye injected into the bloodstream that then highlights any areas of abnormal growth on the scan.

Your doctor may order additional imaging exams and certain laboratory tests (blood and urine analysis) to confirm a diagnosis of a brain tumor.

If imaging tests confirm the presence of a tumor, the next step is to determine if the tumor is cancerous or benign. This is usually accomplished by taking a sample of the tumor, which a pathologist will examine under a microscope. This process is called a biopsy, and it can be done through a stereotactic biopsy or resection.
**Stereotactic biopsy**
A small hole is made in the skull and a needle is guided through it to collect a sample of the tumor for testing.

**Resection**
The skull is opened so that the surgeon can remove most or all of the tumor for testing. Often, if the tumor is benign and can be completely removed, no further treatment will be necessary.

University Hospitals surgeons typically use computer-aided navigation during resection. They sometimes also use other specialized types of pre-operative imaging to identify the locations of functional parts of the normal brain as well as to identify particularly dangerous parts of the tumor so removal of these regions can be prioritized.

Additionally, UH surgeons also sometimes “map” the brain during surgery using techniques to identify important areas of the brain serving certain normal functions as well as to identify invading tumor cells using fluorescence. This is known as fluorescent guided resection (FGR).

UH was one of the first hospitals in the country to adopt FGR with 5-amino-levulonic acid (5-ALA). UH receives funding from the National Institutes of Health for research to assess a new agent to improve the safety and completeness of tumor resections known as PTPu. These techniques are not available at most other centers.
What Are My Treatment Options?

Once your doctor confirms a brain tumor, treatment decisions will likely be made quickly. Even if the tumor is found to be benign, it may put pressure on other sensitive areas of the brain, so removal is usually recommended. If the results of the biopsy and other diagnostic tests indicate that a brain tumor is cancer, the need to act quickly is even more urgent. Some brain cancers are very aggressive and fast-growing, so prompt action is necessary to limit the damage done.

Your treatment recommendations will depend largely on the size, type and location of your tumor. Your age and overall health will also be taken into consideration. Brain tumor treatment plans can be quite complex and will often include a combination of surgery, medical therapies and radiation therapies.

**Surgery**

If a tumor is located in an accessible region of the brain, removing it surgically is often the first step in treatment. For benign tumors, surgery may be the only necessary treatment. Often, removing the tumor relieves pressure on other structures of the brain, and symptoms will be completely resolved after the surgery.

At University Hospitals, we use iMRI (intraoperative magnetic resonance imaging) to help neurosurgeons precisely locate the tumor and remove as much diseased tissue as possible while avoiding critical functional areas of the brain.

If the tumor is malignant (cancerous), surgery will often be followed by chemotherapy or radiation therapy to lower the risk of the cancer coming back. Treatment after surgery is called adjuvant therapy.

For patients with inoperable brain tumors or lesions previously diagnosed as untreatable, there is new hope. Laser interstitial thermal therapy (LITT) technology, which uses MRI-guided lasers to destroy tumors without damaging the surrounding healthy tissue, was pioneered by UH physicians who performed the first studies in patients. It is especially effective in treating glioblastoma – one of the most aggressive and difficult-to-treat brain cancers – and other inoperable brain tumors for patients who otherwise are considered high risk for surgery.
Medical therapies

Chemotherapy
The most well-known medical therapy for cancer is chemotherapy, which uses a powerful drug or combination of drugs to kill cancer cells. The medication is usually delivered intravenously (directly into the bloodstream) but can also be given in the form of an oral medication. Sometimes, if a shunt has been placed to remove excess fluid around the brain, the medication may be delivered through the shunt.

Chemotherapy is usually given in cycles – a few weeks of intensive treatment followed by a few weeks of rest and recovery. Two to four cycles will typically be completed, after which there is a break to measure and monitor the tumor’s response to the therapy. The side effects of chemotherapy are well-known and may include nausea, vomiting, mouth sores, loss of appetite and hair loss. However, there are medications that can help to control these symptoms – nausea in particular is less of a problem these days.

Targeted therapy
Targeted therapies are treatments that use specially formulated medications to identify and attack specific cancer cells without harming normal cells. For example, antibody therapy is a type of targeted therapy that uses antibodies made in the lab from a type of immune cell. The cells are delivered by IV and travel to the tumor, attach themselves to it, and kill it or prevent it from growing. Other types of targeted therapies are currently being studied and developed.

Immunotherapy
Immunotherapy is a treatment that uses the patient’s immune system to fight cancer. Substances made by the body or made in a laboratory are used to boost, direct, or restore the body’s natural defenses against cancer or prevent the cancer from disabling the immune system. UH Cleveland Medical Center and UH Seidman Cancer Center have been leaders in immunotherapy for brain tumors in the U.S. and have written or participated in many of the important trials in this area. This type of cancer treatment is also sometimes called biotherapy or biologic therapy.

Other medications
Some patients with brain tumors are given steroids to relieve swelling and/or anticonvulsants to treat or prevent seizures.

Radiation therapies
Radiation therapy uses targeted rays of high energy to kill tumor cells and stop them from multiplying. Radiation can be used alone or with other forms of treatment (surgery and chemotherapy) depending on the size, location and type of tumor being treated. For example, for tumors that are located very deep in the brain, surgical removal may not be possible. In these cases, radiation and chemotherapy will often be combined to shrink and kill the tumor. Radiation therapy can be delivered in several ways:

External radiation
This is the most common method of radiation therapy. The beam of energy travels through the skin, the skull and healthy brain tissue to reach the target (the tumor). Treatments only last a few minutes and are usually given five days a week for a specified amount of time. This kind of radiation therapy is an outpatient procedure.

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Internal/implant radiation
This is an inpatient procedure that requires a hospital stay. In this method of radiation delivery, a capsule containing a measured amount of radiation is implanted in or near the tumor and slowly releases cancer-killing energy over several days.

Stereotactic radiosurgery
In this highly targeted therapy, a single large dose of radiation is aimed at the tumor from different angles through the skull. Because the skull is not opened, there are fewer complications and a shorter recovery time. Types of stereotactic radiosurgery include:

**CyberKnife®**
This is a noninvasive procedure that targets tumors from more than 1,200 angles with extreme precision. The tumor receives a high dose of radiation, but the surrounding healthy tissue is not harmed.

**Gamma Knife® Perfexion™**
The most advanced radiosurgery available, this technology delivers unparalleled accuracy and dose planning, increased speed and the capability to treat larger tumors.

▶ University Hospitals Cleveland Medical Center is the only hospital in Northeast Ohio to offer both Gamma Knife Perfexion and CyberKnife (robotic) technologies and treatments.

**Elekta Synergy**
Image–guided radiation therapy (IGRT)

Proton therapy
Proton therapy is a relatively new type of therapy available to patients for whom radiation treatment is appropriate. It uses robotic technology and an image guidance system to deliver a precise, focused beam of radiation to cancerous and noncancerous tumors or lesions. Essentially, proton therapy targets and kills tumor cells, while preserving the healthy surrounding tissue. Proton therapy is proving to be an effective treatment for many types of tumors including brain and spine.

▶ Proton therapy is currently available at only 24 locations in the United States. University Hospitals houses the first proton therapy center in Ohio.
Rehabilitation After Treatment

Some cancer therapies may damage healthy tissue and could cause some loss of function. Your doctor may prescribe rehabilitation services to help you return to your normal routines faster. The treatments may include:

- Physical therapy to help you regain strength and balance
- Speech therapy to manage problems with speaking, expressing thoughts or swallowing
- Occupational therapy to ensure you have the skills to manage activities of daily life such as bathing, dressing and toileting

Living with a cancer diagnosis

Even after your cancer has been diagnosed and treated, there are no guarantees it will not come back. It is very important to continue to follow up with your primary care doctor and cancer specialists as instructed once your active treatment plan is finished. The treatments you have undergone may put you at some additional risk for other health problems and possibly recurring cancer.

People who have been treated for cancer of any type often have many worries about the future. They may worry about their work, their family and home life, their life expectancy, and so on. Feelings of anger and resentment are also common. It can be helpful to know you’re not alone. Seek out support from your friends, family members, spiritual advisors and health care team. Talk to them and ask questions – share your feelings and your fears, and don’t be afraid to ask for help. Consider joining a cancer support group, which will allow you to share your experience with others who have been on a similar journey.

People naturally want to know if their cancer will shorten their life expectancy and, if so, by how much. That is a difficult question to answer, as survival rates can vary greatly based on type of cancer, its size and location, your age, and your general health. At University Hospitals, our experts have designed specialized tools to help anticipate your prognosis. Talk to your health care team about realistic expectations given your unique situation.
Why Choose University Hospitals?

At University Hospitals, we believe that collaboration and teamwork among caregivers is essential for achieving the best possible outcome for each patient. Your multidisciplinary care team will be made up of highly specialized experts from the UH Neurological Institute, UH Seidman Cancer Center and UH Cleveland Medical Center. This team collaborates seamlessly to treat both benign and malignant tumors using the most comprehensive range of services and options available nationally and will include:

- Neurologists
- Neuroradiologists
- Nurses
- Radiation oncologists
- Neuro-oncologists
- Neurosurgeons
- Otolaryngologists (ENT)
- Rehabilitation therapists
- Neuropathologists
- Dietitians
- Primary care providers
- Social workers

 Ranked by U.S. News & World Report as one of the top programs in the nation, University Hospitals provides a full spectrum of services to promote, protect and restore brain health for a wide variety of diagnoses, including brain tumor. Our experts collaborate to create a personalized care plan for each patient using the latest clinical advances, treatments, research, medications and leading-edge technologies. The surgeons at the Brain Tumor & Neuro-Oncology Center are skilled in the latest techniques and treatment approaches to minimally invasive brain surgery and other therapeutic methods.

In addition to providing extraordinary patient care, University Hospitals is a National Cancer Institute designated Comprehensive Cancer Center and is committed to developing the next generation of medical and surgical innovations.

Through our collaboration with Case Western Reserve University School of Medicine, our ongoing clinical research programs push the boundaries of medical progress. Our strong emphasis on translational neuroscience means that newly developed drugs, treatments and medical advances transfer more rapidly from the research stage to actual patient care. Our patients have access to the most current clinical trials, treatments and procedures that may be unavailable at other facilities.

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**UH Seidman Cancer Center**
When a brain tumor is cancer, experts from the UH Seidman Cancer Center will join your health care team. Each one of our specialists is dedicated to providing innovative treatments to best fight your disease, and many of them are engaged in promising clinical research in the fight against cancer. The teams at UH Seidman Cancer Center practice in a collaborative setting where they coordinate an individualized treatment plan for each patient to obtain the best possible outcomes.

**Connect with us**
To schedule an appointment with one of our specialists, call **216-910-6183**.

Be inspired by survival stories. Visit [UHhospitals.org/BrainTumor/Stories](http://UHhospitals.org/BrainTumor/Stories) to read stories about people just like you who battled and beat brain tumors.