CONDITION

Brain tumors in adults

Learn about adult brain tumor symptoms, causes, diagnosis, treatment options, complications, and follow-up care.

WHAT IT IS
Abnormal growth of cells in or near the brain

BODY SYSTEM
Nervous system

MAIN SYMPTOMS
New or worsening headaches, seizures, one-sided weakness, speech or vision problems

WHAT CAUSES IT
Usually unknown, rarely inherited

HOW IT IS DIAGNOSED
MRI and tissue biopsy

MAIN TREATMENT
Monitoring, surgery, radiation, or drug treatment

CAN IT BE CURED?
Sometimes - removal may be incomplete

IS IT AN EMERGENCY?
Sometimes - first seizure or sudden weakness

LONG-TERM OUTLOOK
Varies widely from long-term stability to rapid growth or recurrence

Overview

A brain tumor is an abnormal growth of cells in or near the brain. Tumors may begin in brain tissue, the membranes covering the brain, cranial nerves, or nearby structures such as the pituitary gland. Tumors that begin in the brain or nearby tissues are called primary brain tumors.

Cancer that spreads to the brain from another part of the body is called a metastatic, or secondary, brain tumor. Brain metastases are different from primary brain cancer and are treated according to where the cancer began, its biological features, and its effects on the brain.

Brain tumors may be malignant, meaning cancerous, or nonmalignant, sometimes called benign. A nonmalignant tumor does not spread to distant organs, but it can still cause serious

problems by pressing on the brain, nerves, or blood vessels. The tumor's location, growth rate, and molecular features may be as important as whether it is labeled benign or malignant.

There are many types of adult brain tumors. Gliomas develop from cells that support nerve cells and include astrocytomas, oligodendrogliomas, and glioblastomas. Other examples include meningiomas, pituitary tumors, and schwannomas. Modern classification uses changes in tumor genes and proteins, as well as how the cells look under a microscope.

The outlook varies widely. Some tumors grow slowly and can be monitored for years. Others grow quickly or return after treatment. An accurate diagnosis helps the care team select appropriate treatment and explain what to expect.

Symptoms

Symptoms depend on the tumor's size, location, and rate of growth. They can develop gradually or appear more quickly. Many of these symptoms are common and are usually caused by conditions other than a brain tumor.

Possible symptoms include:

A headache caused by pressure inside the skull may be worse in the morning, with coughing, or when bending over. However, headache patterns alone cannot establish the cause. Most headaches are not related to brain tumors.

Call emergency services for a first seizure, a seizure lasting more than five minutes, repeated seizures without recovery, sudden one-sided weakness, sudden difficulty speaking, loss of consciousness, or rapidly worsening confusion. These symptoms may have causes other than a tumor, including stroke, but require emergency assessment.

Promptly contact a healthcare professional about steadily worsening headaches, repeated unexplained vomiting, new balance problems, or gradual changes in thinking, vision, strength, or behavior. These concerns need timely evaluation but are not always emergencies.

- New or changing headaches, especially if they become more frequent or severe
- Nausea or vomiting that is not otherwise explained
- A first seizure or a change in an existing seizure pattern
- Weakness, numbness, or reduced coordination, often affecting one side
- Problems with speech, vision, hearing, balance, or walking
- Changes in memory, concentration, mood, behavior, or personality
- Unusual sleepiness, confusion, or reduced alertness

- Hormone-related symptoms when a tumor affects the pituitary gland or nearby structures

Causes and risk factors

For most primary brain tumors, no single cause can be identified. Tumors develop when genetic changes allow abnormal cells to grow and survive. These changes are usually found only in the tumor and were not inherited from a parent.

Exposure to ionizing radiation is an established risk factor. This is the type of high-energy radiation used in radiation therapy and produced by certain nuclear exposures. A previous course of radiation to the head can increase the risk of a later brain tumor, although the overall treatment benefit may have been much greater than this long-term risk.

A small proportion of brain tumors occur in people with inherited conditions. Examples include neurofibromatosis, tuberous sclerosis, Li-Fraumeni syndrome, and von Hippel-Lindau disease. Genetic counseling may be considered when a person's tumor type, age at diagnosis, family history, or other medical findings suggest an inherited syndrome.

A weakened immune system increases the risk of primary central nervous system lymphoma. Immune suppression may result from certain medical conditions or medicines.

Brain metastases occur when cancer cells travel to the brain from another organ. Lung cancer, breast cancer, melanoma, kidney cancer, and colorectal cancer are among the cancers that can spread to the brain, although many people with these cancers never develop brain metastases.

Research has not established routine mobile phone use as a cause of brain tumors. Diet, stress, minor head injuries, and everyday contact with someone who has a brain tumor are also not recognized causes.

Diagnosis

Evaluation usually begins with a medical history and neurological examination. The clinician may check vision, hearing, eye movements, strength, sensation, balance, reflexes, speech, memory, and attention. These findings can help identify which part of the nervous system may be affected.

Magnetic resonance imaging, or MRI, is the main imaging test for many suspected brain tumors. It uses a strong magnet rather than ionizing radiation. A contrast agent may be given through a vein to make certain tissues easier to see. Specialized MRI techniques can provide information about blood flow, chemical activity, or important brain pathways.

Computed tomography, or CT, may be used in emergencies or when MRI is not suitable. It is useful for identifying bleeding, swelling, calcium deposits, and some effects on the skull. Additional scans may be needed if doctors suspect that a tumor spread from another part of the body.

Imaging cannot always determine the exact tumor type. A biopsy removes tissue for examination by a pathologist. In some cases, the surgeon removes as much of the tumor as safely possible and obtains tissue during the same operation. If open surgery would be unsafe, a needle biopsy guided by imaging may be considered.

The laboratory assessment identifies the tumor's cell type, grade, and molecular features. Grade describes how abnormal the cells appear and how aggressively the tumor is expected to behave. Molecular testing looks for specific genetic or protein changes. These results can clarify the diagnosis, guide treatment, and provide information about likely response.

Some tumors with a typical appearance may be monitored without immediate biopsy, especially when they are small, are found by chance, and are not causing symptoms. The decision depends on the tumor's location, imaging features, and the risks of observation versus intervention.

Treatment and management

Treatment is individualized by a multidisciplinary team. This may include a neurosurgeon, neurologist, medical oncologist, radiation oncologist, neuropathologist, neuroradiologist, rehabilitation specialist, and supportive-care professionals. Important factors include the tumor type, location, molecular features, symptoms, overall health, and personal priorities.

Active monitoring may be appropriate for selected slow-growing or incidentally found tumors. Monitoring usually involves neurological assessments and scheduled MRI scans. Treatment can be reconsidered if the tumor grows or symptoms develop.

Surgery may provide tissue for diagnosis, relieve pressure, and remove some or all of the tumor. The goal is to remove as much tumor as possible without causing unacceptable injury to healthy brain tissue. Mapping, image guidance, and monitoring of brain function may help protect areas involved in movement, language, or sensation. Complete removal is not always safe or possible.

Radiation therapy uses focused high-energy radiation to damage tumor cells. It may be given after surgery, instead of surgery, or when a tumor returns. Treatment may target a broader area over several sessions or use highly focused techniques for selected small tumors or brain metastases.

Drug treatment depends on the diagnosis. Chemotherapy damages rapidly dividing cells. Targeted medicines act on particular molecular changes or cellular pathways. Immunotherapy helps the immune system recognize cancer, although its role varies by tumor type. Treatment for brain metastases is also influenced by the cancer's site of origin and molecular features.

Medicines may help control symptoms. Corticosteroids like prednisone or hydrocortisone can reduce swelling around a tumor, while anti-seizure medicines treat seizures. These medicines can have important side effects and should be started, adjusted, or stopped with medical guidance. Steroids often need to be reduced gradually rather than stopped suddenly.

Rehabilitation may address weakness, speech problems, difficulty swallowing, memory changes, or reduced independence. Palliative care can be provided at any stage to manage symptoms, support decision-making, and improve quality of life. It is not limited to end-of-life care.

Complications

A brain tumor or its treatment can affect movement, speech, vision, thinking, mood, and the ability to carry out daily activities. Possible complications include seizures, swelling around the tumor, bleeding, fluid buildup, and increased pressure inside the skull.

Surgery can cause infection, bleeding, blood clots, seizures, or new neurological problems. Radiation may cause fatigue, skin or hair changes in the treated area, swelling, and delayed effects on memory or healthy brain tissue. Drug treatments can affect blood counts, digestion, energy, fertility, or infection risk. The specific risks differ by treatment.

Some tumors return or continue growing despite treatment. Follow-up imaging helps detect these changes, but scan results can be difficult to interpret. Treatment-related inflammation may sometimes look like tumor growth. The care team may use repeat imaging, specialized scans, or tissue sampling to clarify the cause.

Brain tumors can also affect emotional health, work, driving, finances, relationships, and caregiver well-being. Social workers, mental health professionals, rehabilitation teams, and patient-support services can help address these effects.

Follow up

Follow-up plans vary by tumor type and treatment. Visits may include a neurological examination, review of symptoms and medicines, and MRI scans. Scan timing is based on the diagnosis, previous treatment, stability of earlier images, and current symptoms.

Keep appointments even when you feel well. Bring an updated medicine list and note any new seizures, headaches, weakness, balance problems, thinking changes, or treatment side effects. Ask who to contact between visits if symptoms change.

Driving and work safety should be discussed, particularly after a seizure or when vision, attention, coordination, or judgment is affected. Rules about driving after seizures vary by location.

Seek emergency care for a prolonged seizure, repeated seizures without recovery, sudden neurological symptoms, loss of consciousness, or rapidly worsening alertness. Contact the treatment team promptly for progressive symptoms, fever during treatment, uncontrolled vomiting, or side effects that interfere with eating, drinking, walking, or taking medicines.

Sources

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