

Brain Tumors and Neurologic Oncology Symptoms

A plain-English guide for you and your family

WHAT IS HAPPENING

Your brain sits inside a hard skull that cannot stretch. The skull protects your brain, but it also means there is no extra room. A tumor is a lump of cells that grows where it does not belong. Some tumors start in the brain itself. Gliomas grow from the glial cells (the support cells that hold nerve cells in place and keep them fed). Meningiomas grow from the meninges (the thin wrapping around the brain). Primary CNS lymphomas are cancers of lymphocytes (immune cells) in the brain. Other tumors spread to the brain from cancer that started somewhere else in the body — most often the lung, breast, skin (melanoma), kidney, or colon. Either way, the tumor takes up space. It pushes normal brain tissue out of the way, invades healthy tissue, and presses on nerves and blood vessels. The tissue around the tumor swells up like a bruise. That swelling (called vasogenic swelling (edema), which means fluid leaking out of damaged blood vessels into brain tissue) takes up even more room. Because the skull is rigid, all that extra bulk raises the pressure inside your head. That rising pressure, plus the damage right where the tumor sits, causes the symptoms. You might get sudden weakness or numbness on one side of your body because the tumor is pressing on the motor cortex (the strip of brain that controls movement) or sensory cortex (the strip next to it that feels touch and pain). You might get a headache that is worse in the morning or when you cough or bend over, because pressure builds up when you lie flat all night and spikes when you strain. You might vomit without feeling sick to your stomach first, because high pressure squeezes the area postrema and vomiting center in the medulla (the lower part of the brainstem that runs automatic functions like breathing and heart rate). You might have seizures, because the tumor irritates cortical neurons (the brain cells in the outer layer that control thinking and movement) and makes them fire all at once like a short circuit. You might notice changes in memory, mood, or personality if the tumor sits in the prefrontal cortex (the front part of the brain that handles planning, judgment, and controlling impulses). None of these symptoms is random. Each one points back to the tumor — either where it is or how much pressure it is causing. The body tries to protect itself by shifting cerebrospinal fluid (the cushioning water around the brain) down into the spine and squeezing blood out of veins to make room, but those rescue moves only buy time. If the pressure keeps rising or the tumor keeps growing, the brain can herniate (get pushed down through the bottom of the skull or sideways under the membranes inside), seizures can become nonstop (status epilepticus, a life-threatening electrical storm), or the tumor can bleed. That is why doctors move quickly once they suspect a brain tumor. Imaging with MRI plus gadolinium contrast (a dye that lights up tumors and shows how leaky their blood vessels are) shows the mass, where it sits, and how much swelling is around it. Treatment — surgery, radiation, chemotherapy, or a combination — aims to remove or shrink the tumor and lower the pressure before the brain suffers permanent damage.

What you might feel

- Slow or long-lasting weakness on one side of the body
- Swelling of the optic nerve disk seen on eye exam (papilledema)
- Seizure (sudden shaking, staring, or loss of awareness)
- Headache that is worse in the morning or wakes you up
- Nausea and vomiting, especially in the morning
- Trouble with balance, walking, or coordination
- Changes in personality, mood, judgment, or thinking
- Vision changes such as blurry vision, double vision, or losing part of your field of view
- Trouble speaking or understanding words
- Numbness or tingling on one side of the body

Call the doctor right away if...

- Sudden severe headache or headache that is getting worse quickly
- New seizure in an adult with no history of seizures
- Sudden weakness, numbness, or loss of vision
- Confusion, drowsiness, or loss of consciousness
- Persistent vomiting with severe headache and no other cause

What the care team will do

- Position the head of the bed at 30 degrees and keep the patient's head in midline neutral position, not turned to either side
- Perform and document a full neurologic assessment every 2 to 4 hours using the Glasgow Coma Scale (a 15-point scoring system for eye opening, verbal response, and motor response) and checking pupil size, symmetry, and reaction to light
- Administer dexamethasone (a corticosteroid that reduces brain swelling) exactly on time every 6 hours and monitor blood glucose levels before meals and at bedtime
- Keep two suction setups at the bedside, position the patient on their side during meals, and have padded side rails up with the bed in the lowest position if the patient has had a seizure or is at high risk
- Administer prescribed anti-seizure medication such as levetiracetam or phenytoin at the same times every day and teach the patient never to skip a dose or stop suddenly
- Offer small frequent meals, give anti-nausea medicine 30 minutes before breakfast, and keep the room dim and quiet

- Assess for signs of a clot in a deep leg vein (deep vein thrombosis) (leg swelling, warmth, redness, or pain in the calf) every shift and ensure sequential compression devices (inflatable leg sleeves) are on whenever the patient is in bed
- Monitor intake and output closely, report urine output greater than 200 mL per hour for 2 hours in a row, and check serum sodium and osmolality (concentration of particles in blood) daily

Medicines you may be given — and why

Dexamethasone

Dexamethasone turns down swelling around the tumor. When a brain tumor grows, it squeezes and irritates the tissue nearby. That tissue reacts by swelling — fluid leaks out of tiny blood vessels, and immune cells rush in. The extra fluid raises pressure inside the skull, which causes headaches, confusion, weakness, and sometimes dangerous shifts in the brain. Dexamethasone tells blood vessel walls to tighten up and stop leaking, and it tells immune cells — white blood cells like macrophages and lymphocytes — to calm down and stop releasing inflammatory signals, chemicals like cytokines. Within hours to days, swelling shrinks, pressure drops, and symptoms ease. This gives the patient relief while the team plans surgery, radiation, or chemotherapy.

Levetiracetam (Keppra)

Brain tumors irritate the tissue around them, and that irritation makes neurons — nerve cells — fire in wild, uncontrolled bursts. That is a seizure. Levetiracetam calms those neurons by changing how they release neurotransmitters, the chemical messengers that neurons use to talk to each other. It binds to a protein called SV2A on the storage bubbles inside neurons. When SV2A is bound, neurons release less glutamate — the brain's main excitatory signal — so they are less likely to fire chaotically. Levetiracetam does NOT speed up liver enzymes, which means it does NOT interfere with chemotherapy or other drugs. That is why it is the first-choice anti-seizure drug for brain tumor patients.

Temozolomide (Temodar)

Temozolomide is a chemotherapy pill that damages tumor cell DNA so the cells die when they try to divide. Cancer cells divide fast, and when their DNA is broken, they cannot copy it correctly — so they fail and die. Temozolomide works especially well in the brain because it crosses the blood-brain barrier, the tight fence of cells that blocks most drugs from entering the brain. It is the standard first chemotherapy for glioblastoma and anaplastic astrocytoma, usually given after surgery and during and after radiation. Inside the tumor cell, temozolomide breaks down and sticks small chemical tags — methyl groups — onto DNA at specific spots,

guanine bases. When the cell tries to divide, its repair machinery sees the damage, tries to fix it, fails, and triggers cell death.

Bevacizumab (Avastin)

Tumors grow by building their own blood supply. They release a chemical signal called VEGF — vascular endothelial growth factor — that tells the body to sprout new blood vessels into the tumor, like roots growing into soil. Bevacizumab is a lab-made antibody that sticks to VEGF and blocks it. Without VEGF signals, new blood vessels cannot form, and some leaky vessels tighten up. The tumor gets less blood, which can slow or shrink it. Swelling — swelling (edema) — around the tumor also drops because vessels stop leaking so much fluid. Bevacizumab is used for recurrent glioblastoma, when the tumor comes back after surgery, radiation, and temozolomide, and it often improves symptoms and MRI appearance even if it does not cure the cancer.

Phenytoin (Dilantin)

Phenytoin stops seizures by blocking sodium channels on neuron membranes. Neurons fire electrical signals by opening sodium channels and letting sodium ions rush in — like opening a gate. When a neuron is irritated — by a tumor pressing on it — it fires too fast and too often, and that chaotic firing spreads to other neurons, causing a seizure. Phenytoin binds to sodium channels when they are open and keeps them closed longer, slowing the neuron's ability to fire repeatedly. Rapid, out-of-control firing is blocked, so seizures are prevented. However, phenytoin has a major downside in brain tumor patients: it speeds up liver enzymes — CYP450 enzymes — that break down chemotherapy and other drugs, lowering their levels in the blood and making treatment less effective. For this reason, levetiracetam — Keppra — or other non-enzyme-inducing drugs are preferred. Phenytoin is used only if other options fail or cause intolerable side effects.

Lomustine (CCNU)

Lomustine is a chemotherapy pill that crosses into the brain and kills tumor cells by damaging their DNA. Inside the cell, lomustine breaks down into molecules that add chemical groups — alkyl groups — to DNA strands. These groups make the two DNA strands stick together — cross-link — like gluing two ribbons into a tangled knot. When the cell tries to divide, it cannot pull the strands apart to copy them, so it fails and dies. Lomustine is used for recurrent glioblastoma — when the tumor comes back — and certain oligodendrogliomas, often combined with other drugs like procarbazine and vincristine — the PCV regimen. It is given in cycles — one dose every 6 weeks — because it causes severe bone marrow suppression, a drop in blood cell counts that takes weeks to recover.

Where this information comes from

- NCCN Clinical Practice Guidelines in Oncology: Central Nervous System Cancers 2024
- American Brain Tumor Association
- UpToDate Clinical Overview: Brain Tumors in Adults
- WHO Classification of Tumours of the Central Nervous System 2021

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