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Glioblastoma (GBM)

Glioblastomas (GBM) are tumors that arise from astrocytes—the star-shaped cells that make up the "glue-like," or supportive tissue of the brain. These tumors are usually highly malignant (cancerous) because the cells reproduce quickly and they are supported by a large network of blood vessels.

Location

Glioblastomas are generally found in the cerebral hemispheres of the brain, but can be found anywhere in the brain or spinal cord.

Description

Glioblastomas usually contain a mix of cell types. It is not unusual for these tumors to contain cystic mineral, calcium deposits, blood vessels, or a mixed grade of cells.

Glioblastomas are usually highly malignant—a large number of tumor cells are reproducing at any given time, and they are nourished by an ample blood supply. Dead cells may also be seen, especially toward the center of the tumor. Because these tumors come from normal brain cells, it is easy for them to invade and live within normal brain tissue. However, glioblastoma rarely spreads elsewhere in the body.

There are two types of glioblastomas:

Primary, or de novo: These tumors tend to form and make their presence known quickly. This is the most common form of glioblastoma; it is very aggressive.

Secondary: These tumors have a longer, somewhat slower growth history, but still are very aggressive. They may begin as lower-grade tumors which eventually become higher grade. They tend to be found in people 45 and younger, and represent about 10% of glioblastomas.

Symptoms

Because glioblastomas can grow rapidly, the most common symptoms are usually caused by increased pressure in the brain. These symptoms can include headache, nausea, vomiting, and drowsiness. Depending on the location of the tumor, patients can develop a variety of other symptoms such as weakness on one side of the body, memory and/or speech difficulties, and visual changes.

Incidence

This tumor represents about 15.4% of all primary brain tumors and about 60-75% of all astrocytomas. They increase in frequency with age, and affect more men than women. Only three percent of childhood brain tumors are glioblastomas.

Cause

Like many tumor types, the exact cause of glioblastoma is not known.

Treatment

Glioblastoma can be difficult to treat because the tumors contain so many different types of cells. Some cells may respond well to certain therapies, while others may not be affected at all. This is why the treatment plan for glioblastoma may combine several approaches.

The first step in treating glioblastoma is a procedure to make a diagnosis, relieve pressure on the brain, and safely remove as much tumor as possible through surgery. Because glioblastomas have finger-like tentacles, they are very difficult to completely remove. This is particularly true when they are growing near the parts of the brain that control important functions such as language and coordination.

Radiation and chemotherapy may be used to slow the growth of tumors that cannot be removed with surgery. Chemotherapy may also be used to delay the need for radiation in young children.

Some glioblastoma treatments are available through research studies called clinical trial

Prognosis

Prognosis is usually reported in years of "median survival." Median survival is the time at which an equal number of patients do better and an equal number of patients do worse. With standard treatment, median survival for adults with an anaplastic astrocytoma is about two to three years. For adults with more aggressive glioblastoma, treated with concurrent temozolamide and radiation therapy, median survival is about 14.6 months and two-year survival is 30%. However, a 2009 study reported that almost 10% of patients with glioblastoma may live five years or longer.

Children with high-grade tumors (grades III and IV) tend to do better than adults; five-year survival for children is about 25%.

In addition, glioblastoma patients who have had their MGMT gene shut off by a process called methylation also have prolonged survival rates. The MGMT gene is thought to be a significant predictor of response.

However, not all glioblastomas have the same biologic abnormalities. This may be the reason different patients respond differently to the same treatment and why different patients with the same tumor have different outcomes. Researchers continue to study the common characteristics of long-term brain tumor survivors, and how personalized and targeted treatments may be optimally used to treat brain tumor patients.

Emerging Biomarkers in Glioblastoma

There are a number of biomarkers, or molecular signatures, which have the potential to contribute to diagnosis, prognosis and prediction of response to therapy in glioblastoma.