



American Brain Tumor Association

GLIOBLASTOMA MULTIFORME (GBM) AND ANAPLASTIC ASTROCYTOMA

We appreciate the volunteer assistance of Jeffrey N. Bruce, MD, Assistant Professor of Clinical Neurological Surgery and Program Director of Neuro-oncology, Columbia Medical Center, New York City, New York in the preparation of this article.

Introduction

Any tumor that arises from the glial, or supportive, tissue of the brain is called a "glioma." One type of glioma is the astrocytoma. Astrocytomas are named after astrocytes, the star-shaped cells from which they grow.

Astrocytomas are graded to describe their degree of abnormality. The most common grading system uses a scale of I to IV. On that scale, grade I tumors tend to be benign and grade IV tumors are the most malignant. Or, tumors may be grouped by their rate of growth: low-grade (slow growth), mid-grade (moderate growth), and high-grade (rapid growth). Astrocytomas often contain a mix of cell grades.

The word "anaplastic" means malignant. An anaplastic astrocytoma is a grade III, or mid-grade, tumor. An anaplastic astrocytoma that contains dead tumor cells (necrosis) is called a glioblastoma multiforme. That is a grade IV tumor.

"Glioblastoma," "glioblastoma multiforme," "grade IV astrocytoma," and "GBM" are all names for the same tumor.

Incidence

About 50% of the gliomas are glioblastomas. They are most common in adults ages 45-55, and affect more men than women. Anaplastic astrocytomas occur more often in younger adults. About 9% of childhood brain tumors are glioblastomas.

Cause

The cause of these tumors, as well as other types of brain tumors, is unknown. Scientists have identified abnormalities on chromosomes 10 and 17 which may play a role in the development of these tumors. However, what causes those abnormalities is still uncertain.

Scientists are conducting environmental, occupational, familial and genetic research to identify common links among patients. Detailed information about those studies can be found through a medical literature search. Please call the ABTA office at (800) 886-2282 if you would like instructions for performing such a search.

Symptoms

As a brain tumor grows, it may interfere with the normal functions of the brain. Symptoms are an outward sign of this interference.

Since the skull cannot expand in response to the growth of a tumor, the first symptoms are usually due to increased pressure in the brain. Headaches, seizures, memory loss, and changes in behavior are the most common symptoms. Other symptoms may also occur depending on the size and location of the tumor.

If you would like to know more about symptoms of brain tumors, please see our booklet, [*A Primer of Brain Tumors.*](#)

Diagnosis

Your doctor will begin with a neurological examination followed by an MRI and/or CT scan. The scan will probably be done with and without a contrast dye. If you have a tumor, the scan will help your doctor determine the size, location, and probable type of tumor. Some physicians may also request an MRS scan (magnetic resonance spectroscopy) which measures chemical and mineral levels in a tumor. Those measurements may give a suggestion as to whether a tumor is malignant or benign. However, only an examination of a sample of tumor tissue under a microscope confirms the exact diagnosis.

TREATMENT

Surgery

Generally, the first step in the treatment of these tumors is surgery. The goals of surgery are to obtain tumor tissue for diagnosis and treatment planning; to remove as much tumor as possible; and to reduce the symptoms caused by the presence of the tumor. There are some circumstances, such as certain medical conditions or concerns about the location of the tumor, in which a biopsy may be done in place of surgery. The tissue obtained during the biopsy is then used to confirm the diagnosis.

There are several specialized pieces of equipment available to the neurosurgeon. Brain mapping and functional MRIs help the neurosurgeon determine vital areas of the brain so as to avoid these during surgery. Stereotactic computerized equipment and image-guided techniques can be used by the surgeon as navigational tools. Those tools help to guide the neurosurgeon's access into some of the difficult or deep areas in the brain. Lasers may be used during surgery to vaporize tumor cells. Ultrasonic aspirators are tools which break up and suction out the tumor. High-powered microscopes help the neurosurgeon to better see the tumor.

Because the tentacle-like cells of an astrocytoma grow into the surrounding tissue, these tumors cannot be totally removed. Partial removal can help decrease symptoms; the tissue obtained during that surgery confirms the type of tumor. Radiation is then used to treat the remaining tumor.

Radiation

In adults, radiation therapy usually follows biopsy or surgery. There are different types of radiation which may be given using various doses and schedules.

Conventional external beam radiation is "standard" radiation given 5 days a week for 5 or 6 weeks. Conventional radiation for high-grade astrocytomas is usually aimed at the tumor site and the area around the tumor.

A form of "local radiation" may be used to boost conventional radiation. Most forms of local radiation treat the tumor and the area around the tumor. Stereotactic radiosurgery aims converged beams of radiation at the tumor. Conformal photon radiation (intensity-modulated radiation therapy) shapes radiation beams to the shape of the tumor. Interstitial radiation, in the form of solid or liquid radiation, may be implanted into the tumor during surgery. Photodynamic therapy uses a sensitizing drug and laser light to destroy tumor cells. Boron neutron capture therapy releases radioactive compounds within the tumor.

Radiation sensitizing drugs, chemotherapy during radiation therapy, and drugs which increase oxygen levels in the brain are being studied as ways of making tumor cells more sensitive to radiation or enhancing the effect of radiation. Monoclonal antibodies may be capable of carrying radiation or drugs to the tumor site.

Many of these radiation techniques are investigational and are offered in organized testing plans called clinical trials. Your doctor can tell you if the radiation technique you are considering is a standard treatment or an investigational treatment. We also offer two publications about radiation treatments: [*Radiation Therapy of Brain Tumors: A Basic Guide*](#) and [*Stereotactic Radiosurgery*](#). Please call us if you would like a complimentary copy of either.

Chemotherapy

Researchers continue to look for new drugs to treat glioblastoma and malignant astrocytoma, and there are many drugs under investigation. Some of them are new drugs; some are drugs proven useful in treating other types of tumors in the body; and still others are standard brain tumor drugs given in a different way. For example, high-dose chemotherapy may be combined with stem-cell transplantation to deliver larger doses of drugs. Biodegradable wafers deliver chemotherapy drugs directly into the tumor.

Most chemotherapy drugs fall into one of two groups : cytotoxic drugs and cytostatic drugs. Cytotoxic drugs are designed to destroy tumor cells. They work by making tumor cells unable to reproduce themselves. BCNU, CCNU, procarbazine, cisplatin, temozolomide, and irinotecan are examples of cytotoxic drugs. Of this group, temozolomide is commonly used, along with radiation therapy, as a primary (first) treatment for newly diagnosed glioblastoma.

Cystostatic drugs are used to alter the behavior of a tumor. These drugs work by changing the tumor's environment. There are several different types of cytostatic drugs. For example, angiogenesis inhibitors are cytostatic drugs which stop the growth of new blood vessels around a

tumor. Examples of angiogenesis inhibitors are thalidomide and carboxyamidotriazole. Differentiating agents, such as phenylbutyrate or phenylacetate, are cytostatic drugs which make malignant cells look and act like normal cells. Sometimes, cytotoxic and cytostatic chemotherapy drugs are combined in an attempt to increase both of their effectiveness.

Researchers are also developing new ways of delivering drugs to the tumor. CED, or convection-enhanced delivery, uses gravity to slowly “flow” chemotherapy drug or biologic substances into the tumor site. Other researchers are working with microparticles which release drugs into the tumor at a pre-determined rate.

Chemotherapy may be used in infants and very young children to delay radiation therapy until the age of three or four. Clinical trials are underway to evaluate the most effective ways of treating these tumors in infants and children.

There are several drugs used to relieve the symptoms of a brain tumor. Steroids are drugs used to decrease swelling (edema) around the tumor. Anti-epilepsy drugs control seizures. Anti-emetic drugs prevent vomiting and help control nausea. Additional suggestions for managing side-effects is contained in our publication, [*A Primer of Brain Tumors*](#).

Biologic Therapies

Purposeful altering of the natural behavior of tumor cells is a newer area of medicine called "biologic therapy." Some of the substances used in this type of therapy are found in nature; others are chemicals whose side-effects change tumor cells. The effectiveness of these therapies against brain tumors is under investigation.

Antisense therapies block the messages given off by malignant cells, altering their ability to interfere with the normal growth of surrounding cells. Protease inhibitors, such as tamoxifen, block the ability of tumor cells to make the proteins needed for tumor cell reproduction.

Immunotoxin therapies link a toxin such as pseudomonas to an antibody found only in tumor cells. Interferons are thought to inhibit tumor cell growth by stimulating the immune system; they may also be angiogenesis inhibitors. Most interferon studies use this immune substance in conjunction with another drug or therapy.

Other researchers are using gene therapies as a way of controlling tumor growth. In one method, specially-engineered genes make tumor cells more susceptible to drug therapy. In another method, gene therapy is used to stimulate the body's natural production of immune substances. Or, gene therapy may be used to restore the normal function of tumor suppressing genes within tumor cells.

Evaluating Treatment

When evaluating a treatment, ask your doctor how the recommended treatment will affect your prognosis. What are the expected benefits of this treatment? What are the risks? What quality of life can you expect during and after the treatment? If this is an investigational treatment, how many patients with your tumor type have received this treatment, and what were their results?

Resources

Support groups and pen-pal programs allow you to share experiences with others in the same situation. Social workers can help you find these support networks, as well as sources of financial assistance, transportation help, home-care needs or hospice programs. Nurses can provide you with information about how to care for yourself or your loved one. Reach out to neighbors, family, and friends for help with daily chores. Many families living with brain tumors find assistance through cancer support resources. We can help you locate these resources in your area.

A Next Step

[Becoming Well Again](#) is an ABTA quality of life series exploring rehabilitative medicine, memory retraining, caregiver stress management, and managing fatigue. Please call us at 800-886-2282 for a copy of the series. Our web site - www.abta.org - offers extensive brain tumor information, treatment and research updates, and patient/family stories. The thread that runs through each of our services and programs is hope. Become involved - join us in some way, to make sure there is a cure, and ultimately, a way to prevent brain tumors.

We hope that the information in this pamphlet helps you communicate better with the people who are caring for you. Our purpose is not to provide answers; rather, we encourage you to ask questions.

June, 2007