American Association of Neurological Surgeons

Astrocytoma Tumors

Patient Information

This resource, developed by neurosurgeons, provides patients and their families trustworthy information on neurosurgical conditions and treatments.

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Brain tumors may arise primarily from brain cells such as astrocytes or neurons (known as primary brain tumors) or spread to the brain from other parts of the body (known as metastatic brain tumors). Glia are the most common form of brain cells, and astrocytes are a category of glial cells. Tumors that arise from glial cells are known as gliomas; a more precise description would be to categorize the tumor based on the specific type of glial cells. Hence, the term astrocytoma is used for tumors that arise from astrocytes.

Astrocytoma is the most common glial tumor and can occur within the brain and spinal cord.

Symptoms

The symptoms that patients present with are predicated by the location of the tumor; headaches, nausea and vomiting are common, as is the occurrence of a seizure. Seizures may manifest as a twitching in the face, arm, or leg and numbness may occur in these areas. Family members of the patient sometimes describe a staring-like episode, during which the patient seems detached. Other symptoms include mood or personality changes, weakness, speech problems or blurred vision. With a spinal cord astrocytoma, weakness or clumsiness of the arms or legs, gait, bowel or bladder problems may be reported.

Symptoms vary depending on the location of the brain tumor, but can also include any of the following:

- Persistent headaches
- Double or blurred vision
- Vomiting
- Loss of appetite
- Changes in mood and personality
- Changes in ability to think and learn
- New seizures
- Speech difficulty of gradual onset

Any of these symptoms should prompt consultation with a physician or neurosurgeon, and an immediate CT or MRI scan will attempt to reveal the problem. Contrast dye is administered through an IV during these scans to increase the sensitivity and specificity of the test. A dye allergy may be overcome by careful pre-medication. Control of symptoms usually involves initiation of an anti-epileptic medication (Keppra) and steroid (Decadron). The next step is consultation with a neurosurgeon who specializes in brain tumors. A further review of the case by a multidisciplinary tumor board is a prudent measure. The imaging findings on the CT and MRI scans give the neurosurgeon an idea of the nature of the tumor; however, an accurate diagnosis requires a neuropathologist to study the tumor tissue, which guides further treatment.

Classification and Diagnosis of Astrocytomas

Astrocytomas are categorized based on features noted when they are studied on pathology slides. These histological features lend to different grades of astrocytoma (Grade I-IV), which have vastly different patterns of behavior. Grade I tumors tend to be very benign and more common in children, while Grade II tumors tend to be indolent, slow-growing tumors in young adults who frequently present with a seizure. Grade III and IV tumors are more common in adults, are slightly more common in men and tend to have more aggressive behaviors and growth patterns.

If feasible, Grade I tumors are best treated with surgical removal, which can be curative in some instances. Grade II tumors are also removed with surgery. However, surgery may involve parts of the brain that are essential for important functions, such as speech or moving the arms and legs. Hence, surgery must be performed in the safest possible manner, at times with mapping of the brain both prior to and during surgery. Unlike the Grade I astrocytoma, Grade II tumors inevitably progress to a higher grade, albeit in a slow manner that spans several years. Some patients with Grade II astrocytomas may be considered to have a slightly higher risk of progression, and radiation or chemotherapy may be considered. Grade III and IV astrocytomas are considered malignant gliomas, and are treated with aggressive surgical removal followed by fractionated radiation that spans five to six weeks, with concurrent or sequential chemotherapy. Once again, careful preservation of a patient's functions is important, as this will facilitate the administration of the other treatments and minimize risk of complications, such as blood clots in the legs or arms.

Surgery

The main goal of surgery is to remove as much of the tumor as possible without injuring normal brain tissue, especially parts that are essential for important functions, such as the ability to speak or use the arms and legs effectively. Except for Grade I tumors, all other grades of astrocytoma have diffuse margins and infiltrate the surrounding brain tissue, often in a manner that is difficult to distinguish at the time of surgery. It is impossible to remove the entire tumor; however, skilled neurosurgeons can remove as much as safely possible. This has the benefit of reducing the tumor bulk and pressure on the adjacent brain, reducing the risk of seizures, providing adequate tumor tissue for histology/genetic studies and at times, allowing the implantation of chemotherapy wafers if indicated. Surgery to remove a substantial portion of the tumor has been shown to have a benefit on patient survival. Tumors that are in locations inaccessible to surgical removal, due to the risk of damage to the eloquent brain, may be subjected to a biopsy in order to make the diagnosis. Refinements in anesthesia and neurosurgical techniques have made these procedures safe endeavors with almost no risk of mortality, and have an acceptable risk of neurological or non-neurological complications.

Radiation and Chemotherapy

Radiation and chemotherapy are standard treatments following surgery for Grade III and IV astrocytomas. Radiation therapy is effective in killing the tumor cells, especially when it is administered in fractions. The standard treatments are administered five days a week, for six weeks. The dosage and distribution of radiation is carefully contoured using computer algorithms, tailored to maximize the effectiveness in killing tumor cells and minimizing damage to the surrounding brain. Focused beam radiation treatments (stereotactic radiosurgery) are not recommended for up-front treatment of malignant gliomas but maybe employed very selectively in some cases of tumor recurrence. Chemotherapy is generally in the form of an oral medication (Temozolomide) that is well tolerated, but careful attention is paid to the blood counts as these may be negatively affected.

Almost all Grade II tumors eventually progress to Grade III, and almost all Grade III tumors progress to Grade IV tumors. Despite the best treatments with surgery, radiation and chemotherapy, almost all Grade IV tumors recur. Hence, constant vigilance and surveillance MRIs are essential. Research has provided important breakthroughs and avenues of treatment for these recurrent malignant gliomas. Therefore, it is essential for a patient to be under the care of a multidisciplinary neuro-oncology team, so they can be provided with state-of-the-art treatment at each stage. Neurosurgeons form the core of this team and work closely with the radiation and medical oncologists to provide their patients with optimal care and treatment.

The AANS does not endorse any treatments, procedures, products or physicians referenced in these patient fact sheets. This information is provided as an educational service and is not intended to serve as medical advice. Anyone seeking specific neurosurgical advice or assistance should consult his or her neurosurgeon, or locate one in your area through the AANS' "Find a Board-certified Neurosurgeon" online tool.