Brain Tumor - Grades and Prognostic Factors [1]

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ON THIS PAGE: You will learn about how doctors describe a brain tumor's growth or spread. This is called the grade. You will also learn about the prognostic factors doctors use to help plan treatment. To see other pages, use the menu on the side of your screen.

A staging system is used for most other types of cancer to describe where a tumor is located, if or where it has spread, and whether it is affecting other parts of the body. However, there is no recommended systemic staging system for adult brain tumors because most primary tumors do not usually spread beyond the central nervous system. The grading system described below is always used instead because how cancerous a tumor is and how likely it is to grow depends on its specific features.

Prognostic factors

To decide on the best treatment for a brain tumor, both the type and grade of the tumor must be determined. There are several factors that help doctors determine the appropriate brain tumor treatment plan and determine prognosis:

- **Tumor histology.** As outlined in the Diagnosis [3] section, a sample of the tumor is removed for analysis. Tumor histology includes the type of tumor and the grade.

  Grade describes how much the tumor cells look like healthy cells when viewed under a microscope. The doctor compares the tissue from the tumor with healthy tissue. Healthy tissue usually contains many different types of cells grouped together. If the tumor looks similar to healthy tissue and contains different cell groupings, it is called differentiated or a

low-grade tumor. If the tissue looks very different from healthy tissue, it is called poorly differentiated or a high-grade tumor. Generally, the lower the grade, the better the prognosis, which is the chance of recovery. Also the likelihood of controlling a tumor's growth over a long period of time is better for a low-grade tumor.

Specifically for glial tumors, the grade is determined by its features, as seen under a microscope, according to the following criteria:

- Grade I is a separate group of tumors called juvenile pilocytic astrocytoma (JPA). The term juvenile does not refer to the age of the patient, but the type of cell. This is a noncancerous, slow-growing tumor that can often be cured with surgery. It is different from a low-grade astrocytoma or Grade II glioma, which are likely to come back after treatment.

- A grade II tumor does not have dead cells in the tumor, called necrosis, but shows an abnormally large number of cells, called hypercellular.

- A grade III tumor is hypercellular and has cells that are actively dividing, called mitosis. It is often called anaplastic astrocytoma. A grade IV tumor is usually a glioblastoma, also called glioblastoma multiforme or GBM. Cells in the tumor are actively dividing, and it has blood vessel growth and areas of dead cells in addition to the factors common to grade II and III tumors.

- **Age of patient.** In adults, the age of the patient and his or her level of functioning, called functional status (see below) when diagnosed is one of the best ways to predict a patient's prognosis. In general, a younger adult has a better prognosis.

- **Extent of tumor residual.** Resection is surgery to remove a tumor, and residual refers to how much of the tumor remains in the body after surgery. A patient's prognosis is better when all of the tumor can be surgically removed. Four classifications are used:

  - Gross total: The entire tumor was removed. However, microscopic cells may remain.

  - Subtotal: Large portions of the tumor were removed.

  - Partial: Only part of the tumor was removed.

  - Biopsy only: Only a small portion, used for a biopsy, was removed.

- **Tumor location.** A tumor can form in any part of the brain. Some tumor locations cause more damage than others, and some tumors are harder to treat because of their location.

- **Functional neurologic status.** The doctor will test how well a patient is able to function and carry out everyday activities by using a functional assessment scale, such as the Karnofsky Performance Scale (KPS), outlined below. A higher score indicates a better functional status. Typically, someone who is better able to walk and care for themselves has a better prognosis.

  100 Normal, no complaints, no evidence of disease

  90 Able to carry on normal activity; minor symptoms of disease

  80 Normal activity with effort; some symptoms of disease

  70 Cares for self; unable to carry on normal activity or active work

  60 Requires occasional assistance but is able to care for needs

  50 Requires considerable assistance and frequent medical care

  40 Disabled: requires special care and assistance

  30 Severely disabled; hospitalization is indicated, but death not imminent

  20 Very sick, hospitalization necessary; active treatment necessary

  10 Moribund, fatal processes progressing rapidly

  0 Dead

- **Metastatic spread.** A tumor that starts in the brain or spinal cord, if cancerous, rarely spreads to other parts of the body in adults, but may grow within the CNS. For that reason, with few exceptions, tests looking at the other organs of the body are typically not needed. A tumor that does spread to other parts of the brain or spinal cord is linked with a poorer prognosis.

- **Biogenetic markers.** Certain molecular markers found in the tumor tissue can provide information on prognosis and whether treatment will work well. For instance, for oligodendroglioma, the loss of part of chromosome 1 on the p part of the chromosome, and the loss of part of chromosome 19 on the q part of the chromosome, called a 1p and 19q co-deletion, is linked to more successful treatment, particularly with chemotherapy, and can be used to help plan treatment, especially for anaplastic oligodendroglioma.

Mutations in the *isocitrate dehydrogenase* (*IDH*) gene which is found in about 70% to 80% of low-grade gliomas in adults has been linked with a better prognosis. Higher-grade tumors can also have *IDH* gene mutations, which suggests that these tumors started as lower-grade tumors that became a higher grade. This mutation is also linked with a better prognosis in higher-grade tumors.

In glioblastoma, whether a gene called *methyl guanine methyl transferase* (*MGMT)* is changed can help understand a patient's prognosis, and it is being tested in clinical trials.

- **Recurrent tumor.** A recurrent tumor is one that has come back after treatment. If the tumor does return, there will be another round of tests to learn about the extent of the recurrence. These tests and scans are often similar to those done at the time of the original diagnosis [3].

Currently, the factors listed above are the best indicators of a patient's prognosis. As discussed in Diagnosis [3], researchers are currently looking for biomarkers in the tumor tissue that could make a brain tumor easier to diagnose and allow for the staging of an adult brain tumor in the future. Researchers are also looking at other genetic tests that may predict a patient's prognosis. These tools may someday help doctors predict the chance that a brain tumor will grow, develop more effective treatments, and more accurately predict prognosis.

Used with permission of the American Joint Committee on Cancer (AJCC), Chicago, Illinois. The original source for this material is the AJCC Cancer Staging Manual, Seventh Edition *published by Springer-Verlag New York, www.cancerstaging.net* [4].

Information about the tumor's grade, as well as the prognostic factors, will help the doctor recommend a specific treatment plan. The next section in this guide is Treatment Options [5]. Or, use the menu on the side of your screen to choose another section to continue reading this guide.

Links
[1] http://www.cancer.net/cancer-types/brain-tumor/grades-and-prognostic-factors
[2] http://www.cancer.net/about-us
[3] http://www.cancer.net/node/18567
[4] http://cancerstaging.net/
[5] http://www.cancer.net/node/18569