



Treatments for different brain tumors will depend on symptoms, location and biological aggressiveness of the tumor, the extent of possible surgical resection, and the tumor tissue pathology characteristics. Below is a general overview of most current treatment options available for brain tumor patients. *Always consult with your doctor or neuro-surgeon concerning the most appropriate treatment options for you.*

Surgery

Most brain tumor patients' treatment begins – if possible – with surgery to remove as much of the tumor as possible without damaging critical healthy tissue.

Thankfully, neurosurgery and imaging technology, tools, and techniques have improved – and continue to do so – over the past decade, and many new advances are available to help surgeons at top brain tumor centers remove brain tumors with more precision and completeness.



Patients should discuss and understand their surgery and the different surgical options now available for patients with their medical team.

Chemotherapy

Chemotherapy (often abbreviated as “chemo”) refers to chemical compounds – or drugs – that kill fast-dividing cells, like cancer cells. It is prescribed when surgery and/or radiation are not enough to remove a tumor and is used most often for treatment of malignant tumors. Chemotherapy can be provided to the patient in three forms:

1. **Chemotherapy wafers** inserted directly into a resection cavity (the area in the brain where the tumor was located) during surgery.
2. **Intravenous (IV) chemotherapy** provided by injection (or “infusion”) of the drug directly into a patient’s vein.
3. **Oral chemotherapy** administered via a pill that is taken by mouth.



Radiation Therapy

Radiation therapy (also called “radiotherapy,” “irradiation,” or simply “radiation”) is another standard treatment that many brain tumor patients will receive. Radiation therapy involves the use of x-rays, gamma rays, neutrons, protons, and other sources to kill cancer cells and shrink tumors by damaging their DNA. Radiation may come from a machine outside the body (external-beam radiation therapy), or it may come from radioactive material placed in the body near cancer cells (internal radiation therapy or brachytherapy).

Like surgery, there are now many newer and emerging radiation technology, tools, and techniques, including radiosurgery (also called stereotactic radiosurgery) and proton beam therapy.



A number of different chemotherapies are approved for use in brain tumors:

- **Temozolomide (or Temodar or TMZ)**: An oral chemo drug most often prescribed to patients with high-grade gliomas.
- **Nitrosourea**: A class of chemotherapies that include two drugs – *Lomustine (CCNU)* and *Carmustine (BCNU or BiCNU)* – sometimes used in treatment of malignant gliomas. *Carmustine* is sometimes given to patients via a chemotherapy wafer called *Gliadel Wafer*. *Lomustine* is sometimes administered as part of a three-drug combination called *PCV*, which also includes the chemotherapy drugs *Procarbazine* and *Vincristine (Onocovin)*.
- On rare occasions the chemotherapy drug *Irinotecan (Camptosar)* is sometimes used “off-label” in gliomas.

Targeted Therapy (*Precision Medicine*)

A type of treatment that uses drugs targeting the specific changes and molecular alterations in tumors that drive their growth. Some targeted therapies block the action of certain enzymes, proteins, or other molecules involved in the proliferation and spread of cancer cells and often require that the tumor is tested to check whether it contains a target for which there is an available drug. Targeted therapies may also be designed to home in on and attack tumor cells specifically, causing less harm to normal cells.

For brain tumors, there have been two targeted treatments approved and sometimes used in treatment:

- **Avastin (bevacizumab):** An anti-cancer drug that targets tumor induced new blood vessel formation. It is currently approved to treat recurrent glioblastoma patients.
- **Afintor/Everolimus:** approved to treat a very rare brain tumor called subependymal giant cell astrocytoma (SEGA) associated with a condition known as tuberous sclerosis (TS).



Tumor-Treating Fields

A medical device (a wearable cap connected to a battery pack in a backpack) called “Optune” (NovoTTF-100A Device) that is applied with electrodes placed on a patient’s scalp and delivers alternating electric fields to disrupt tumor growth. This treatment is approved for use in glioblastoma patients.



Clinical Trials



Many clinical trials evaluating new potential drugs to treat brain tumors are ongoing. Clinical trials – though the treatments are still “investigational” (or experimental) and not yet FDA approved – can sometimes be the best avenue for patients with difficult to treat brain tumors to access the most cutting-edge emerging treatments and improve the opportunities of finding a new treatment that may be effective for them (and for other future patients).

Patients and caregivers can search for clinical trials using the *NBTS Clinical Trial Finder*:

trials.braintumor.org

Supportive Care

To help manage side-effects of the tumor and/or treatments administered, many patients are provided with: anti-seizure/anti-epileptic medications to control seizures caused by a brain tumor; steroids to reduce brain swelling and inflammation; pain relievers; anti-nausea, antibiotics, and other medication to combat chemo-related side-effects.

Additionally, some patients find benefit from other measures of palliative care including certain diets, eastern medicine, yoga, meditation, acupuncture, etc.



FDA Approved Treatments for Brain Tumors

1. **Afintor/Everolimus:** Approved for subependymal giant cell astrocytoma patients with tuberous sclerosis.
2. **Bevacizumab/Avastin:** Conditionally approved for recurrent GBM.
3. **Carmustine/Lomustine:** Approved for glioma patients, and most often used in low-grade gliomas and in recurrent GBM patients
4. **Temozolomide/Temodar:** Approved for newly diagnosed GBM.
5. **Optune (NovoTTF-100A Device):** Approved for recurrent and newly diagnosed GBM.

If you feel uncertain about your initial diagnosis, recurrence, or response to treatment, it may be beneficial to consider additional opinions for other neuro-oncologists and medical centers.